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CONTENTS.

EDITORIALS.....761
Government Suit Against Manufacturers of Incandescent Lamps Settled.....764
Missouri Conservation Society.....764
The Chicago Signal Club.....764
Schuyler Skaats Wheeler.....765
Minneapolis 1912 Show.....766
New York Electrical Show.....766
Annual Meeting of American Electric Railway Association.....766
Transforming Stations of Niagara Electrochemical Industries.—I.—By A. J. Jones.....767
Patents and Pooling Arrangements.....773
The Electric Vehicle Association of America.....774
Fall Opening of Automobile Trade in Chicago.....777
Examination for Electrical Assistant.....777
International Society for Testing Materials.....777
Washington Section Meets.....777
The Electrical Exhibition in London.—By our London Correspondent.778
Electrical Exports for August.....778
ELECTRICAL NOTES FROM GREAT BRITAIN.—By our London Correspondent.....779
Important Patent Decision on Gas-Producer Operation.....780
Beauty in Public Utilities.....780
BOOK REVIEW.....780
No Chicago Electric Show for 1912.....780
ELECTRICAL NOTES FROM CONTINENTAL EUROPE.—By our Paris Correspondent.....781
Vehicle-Battery Practice in Central-Station Companies.—By S. C. Harris.....783
Low-Pressure Turbine Test.....785
Utilization of Peat.....785
Introducing Ornamental Street Lighting in Peoria, Ill.—By T. P. Pinckard.....786
Power Rates for Pumping.....787
Additional Co-operative Electrical Advertising Page in Cleveland.....787
A Porch-Light Campaign.....787
Processes for Modifying the Color of Mercury-Vapor Lamps.....788
Street-Car Lamp Tests in Chicago.....791
Making Electric Lights More Convenient.....791
New Naval Wireless Station at Washington.....792
Condenser Losses at High Frequencies.....793
A New Wireless-Telephone System.....793
Electric Power in a Bakery.....794
1,650 Volts for Railway.....795
Electrical Equipment of a Newspaper Plant.....795
New Process for the Fixation of Nitrogen.....795
Electric Power in Making Cement.....796
Production of Electric Steel.....796
FINANCIAL REPORTS OF ELECTRICAL COMPANIES.....797
AMONG THE CONTRACTORS AND SUPPLY MEN.....797
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES.....798
CURRENT ELECTRICAL NEWS.....805
PUBLIC SERVICE COMMISSION NEWS.....805
DIRECTORY OF ELECTRICAL AND ALLIED ENGINEERING AND SCIENTIFIC SOCIETIES.....812
RECORD OF ELECTRICAL PATENTS.....814

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THE SETTLEMENT OF THE LAMP SUIT.

On March 3 suit was brought by the Attorney-General of the United States against thirty-five companies engaged in the manufacture and sale of electric incandescent lamps and of machinery and accessories incident to the manufacture of this apparatus.

It was alleged that these companies had conspired to effect a monopoly in restraint of trade, in violation of the Sherman Act. So far as the electrical industry was concerned this was the most momentous announcement which had been made since the first commercial application of electrical utilities, and ever since the electrical fraternity has awaited with keen interest the outcome of this suit.

On another page of this issue we announce the agreement of the interests involved upon a decree which is satisfactory to the attorneys for the manufacturers and the Department of Justice.

The principal interests involved in this suit by the Government are the General Electric Company and the National Electric Lamp Company. What the outcome of the Government's activity in this instance will be or what method of reorganization will be followed can now only be conjectured, but it is to be sincerely hoped that the great development that has come about in the manufacture of incandescent lamps since the co-ordination of the work of these two great organizations took place, some years ago, will not be hindered. The National Electric Lamp Company, through the National Electric Lamp Association, with its physical laboratory, its highly efficient engineering department, and through the agency of the unusually capable managers of its constituent organizations, in the briefest possible space of time advanced the art of electric illumination and conferred upon the entire electrical industry a wholesome, lasting and, incidentally, very profitable stimulus.

The decree dissolves the National Electric Lamp Company. To what extent this will change the actual present state of affairs so far as the manufacture and sale of incandescent lamps are concerned will not be known until a fuller understanding of the relation of the constituent companies to the main organization is arrived at. Whatever may have been the merits or otherwise of the contentions of the litigants, the decree changes very materially the situation so far as the resale of lamps is concerned, prohibiting, as it does,

agreements upon the resale price and placing jobbers under no obligation to maintain prices except as it concerns their own satisfaction as to what their profit shall be. Another equally important phase of the decree is that feature which throws wide open the market in the manufacture and sale of carbon lamps.

RATINGS.

The method of rating machinery is a matter of more than superficial importance. Purchase is usually based upon a rating which is supposed to cover the necessities of the purpose for which the machinery is to be used, and unless the method of rating used by the manufacturer is clearly understood by the purchaser, disappointment and loss are likely to ensue.

There are a variety of bases upon which ratings may be made. The ultimate capacity of the machine is one basis, the load at which maximum efficiency is secured is another, the load at which deterioration is least is another, the load which is fixed by some limitation of operation is another, and so on. Most electrical apparatus is limited in capacity by the allowable temperature rise, and the rating is made upon this basis. The Standardization Rules of the American Institute of Electrical Engineers fix the allowable temperature, and performance specifications are drawn to coincide with these rules or else specify other limiting temperatures considered more suitable for the given working conditions. Since the specified temperatures for continuous operation at full rated load are not the highest which the insulation can stand without injury, there remains a margin which permits of temporary overloads of considerable magnitude.

The rating of incandescent lamps is upon an entirely different basis. Like the current-carrying machinery, life would be destroyed, and the object made useless by very excessive current, while on the other hand life can be extended indefinitely by operation with sufficiently low current. But the lamp differs from the machine in that its efficiency varies very rapidly with the current. It becomes necessary then to balance operating efficiency against the cost of renewal, and the logical rating is that at which the combined cost of operation and renewals bears the lowest ratio to output. This is the practice followed by lamp manufacturers, and since the cost of operation differs in different places, a triple rating has been adopted by many of them, which takes this difference into account. This method of rating leaves little margin for overload, but since under ordinary conditions overload is unlikely, the method is satisfactory. Under conditions of possible overload, as on series circuits, the user must take his own precautions, as by normal operation at less than the rating.

With arc lamps, unfortunately, no such logical method of rating has been followed out as in the cases of incandescent lamps and of machinery. There has been no uniformity among different manufacturers, unless, indeed, it lay in uniformly rating at an excessively high value. The result has been that the rating gave nothing more to the purchaser of arc lamps than a crude idea of what he was getting. The misrepresentation was so flagrant that some of the manufacturers adopted a "nominal-candlepower" rating, which still left the purchaser without any definite knowledge of what he was getting, although it relieved the manufacturer of the charge of misrepresentation. Only recently has the rating of arc lamps been made with the accompaniment of distribution curves and a statement of actual candlepower. A definite standard of rating is still lacking, and no better demonstration of its want is needed than is afforded by the conditions prevailing here as compared with those existing in the cases mentioned above.

Turning to steam engines, we find the rating to be based upon operation at maximum efficiency and normal speed. There is a definite ratio of expansion for which the steam consumption per horsepower is a minimum and this is usually assumed to be given by cut-off at one-quarter stroke. Practice is not entirely uniform here, however, and there is a certain leeway dependent upon personal opinion or the characteristics of the particular engine. In any case there is ample margin to take care of overload and a fairly definite general understanding as to what the rating signifies.

With steam turbines, on the other hand, there is no such general understanding and uniformity of practice, and it is not safe for the operating steam engineer to assume that a turbine with a given rating is capable of carrying the same overload that may be saddled upon a reciprocating engine of the same rating. This arises solely from the method of rating. Since the output of a turbine is only limited by the amount of steam which can be utilized at a definite pressure and speed, a manufacturer may rate it at this output, which of course represents a load which can be carried continuously. This maximum rating, however, allows no margin for overload without raising the steam pressure and hence may often lead to trouble if the operator counts upon carrying greater loads at times, as he has been accustomed to do with reciprocating engines. This scheme of rating is sometimes used. On the other hand, other manufacturers use what is called a normal rating, which consists, substantially, in rating at not more than four-fifths of the ultimate capacity, for the purpose principally of allowing a margin for overload and for contingencies, such as loss of vacuum, which may interfere with a maximum output.

Both of these methods of rating have logical support, but it is unfortunate for the purchaser that two methods exist, since it makes the problem of comparison and of choice for his purpose, more difficult. It is also easier for

unscrupulous salesmen to deceive the purchaser and sell him something that does not answer his purpose, under the delusion that it is cheaper. A uniform method of rating should be adopted just as quickly as possible, and nobody is in a better position to determine what that method should be than the American Society of Mechanical Engineers. By adopting such rules concerning steam machinery as the Institute of Electrical Engineers has done for electrical machinery, it will perform a real service to the country. In the mean time, purchasers of turbines should be sure that they understand just what the capacity of proffered machines may be, and not assume that different ratings are on the same basis. Where ratings are based on maximum possible output it must be understood that an overload cannot be carried, and where overloads are expected the rating must be sufficient to cover them.

A PLAN FOR INTRODUCING THE ELECTRIC RANGE.

Electric cooking has been accorded a position of prominence in central-station affairs for some time, although the advances in this new field have hardly been commensurate with the wonderful development of the numerous other applications of electrically operated devices, both for convenience and the necessities of every-day existence. In the early stages of the art the limited use of electricity was due to the tardy introduction of suitable electric devices, also to the prejudice fostered by the unsatisfactory life of some of the early apparatus. The rate charged by most central stations also had its influence and at first largely retarded the use of electricity for general heating or cooking.

Within the past two or three years, however, all of the original objections have been most happily overcome. A more recent obstacle to the really successful installation of the larger heating and cooking devices which has arisen has proved to be the inadequate carrying capacity of the interior wiring of most residences. This difficulty has been and is being overcome in a measure by a process of education and the co-operation on the part of the central station with architects and contractors, in an effort to secure the installation of heating and power circuits in new residences and apartment houses.

Those who have kept in close touch with central-station affairs have predicted that the success of electric cooking depends to a very great extent on the application of the fireless-cooker principle to electric ranges. This has been taken into consideration by the manufacturers and several ranges are now available embodying this principle with the added features of automatic control and new and improved design. High cost of electric ranges has been held by some as responsible for their comparatively slow adoption. While their cost is of course dependent on the number sold, the present cost is not prohibitive and when intelligently directed the outlay for current need not be excessive. But their attraction lies not so much in actual economy they may accomplish as in the fact that they make cooking really clean, cool and comfortable—features particularly appreciated by the housewives.

As has been true in the case of the electric vehicle, the flat iron, and all other current-consuming devices, it now devolves on the central-station company to take the initiative in the sale of electric ranges. It is of course recognized that the most effective method of doing this would be to place the ranges on trial and allow the consumer to learn by actual test the advantages of electric cooking. As this method is not feasible, in most cases, an admirable substitute suggests itself in connection with the many church suppers and luncheons that are given by ladies' organizations almost continuously during the fall and winter months.

Why would it not be a good plan for the central-station new-business department to keep in touch with these affairs and offer to loan gratis an electric range to the church on which to prepare the meal with the only stipulation that the tickets should make some suitable mention that the food is electrically cooked? Some churches are equipped with kitchens and some are not, but the great majority are wired for electricity and this, of course, is the only requirement. Where the church is not provided with a kitchen an improvised one could be hastily fitted up, with little expense, and the fact that each contributor to the meal could prepare her food on an electric range would be an attractive feature.

In any event, by this plan the central-station company would bring the range before the attention of a very desirable class of prospective customers and it is safe to predict that in every case the expense would be more than justified.

UNEARNED INCREMENT AND RATE-MAKING.

An interesting point in connection with the valuation of real estate belonging to a public-service corporation which should be used for rate-making purposes, has arisen in Des Moines, Iowa. The gas company in that city had purchased certain real estate for $35,000 and in the course of time the unearned increment had increased the value, exclusive of improvements, to $200,000. This unearned increment did not represent any investment, and the question was as to whether fixed charges should be based upon the cost price or the present value. In his testimony in this case, Edward W. Bemis, who has taken a prominent position as an expert in rate-making cases, maintained that the increment in value, which is due to social growth, should not be considered in making rates. In the final disposition of the property among the stockholders, assuming its affairs to be wound up, this value would accrue to them in the form of dividends, and in the meantime they have no claim to additional dividends in the shape of a return upon property which represents no investment.

GOVERNMENT SUIT AGAINST MANUFACTURERS OF INCANDESCENT LAMPS SETTLED.

DECREE AGREED UPON BY WHICH LAMP MANUFACTURERS ADJUST THEIR DIFFERENCES WITH THE DEPARTMENT OF JUSTICE.

On March 3 of this year the Attorney-General of the United States brought suit, through the United States District Attorney, W. L. Day, in the United States Circuit Court for the Northern District of Ohio at Cleveland, O., against thirty-five electrical and other manufacturing companies, alleging an unlawful combination and use of contracts in restraint of trade in the manufacture and sale of incandescent electric lamps. This proceeding in equity was brought against the General Electric Company, the Westinghouse Electric & Manufacturing Company, the Westinghouse Lamp Company, the National Electric Lamp Company and thirty-one other companies manufacturing and selling incandescent lamps or manufacturing and selling machinery and appurtenances accessory to the manufacture and sale of incandescent lamps. The individual companies involved and the specific charges alleged in the Government's petition and prayer were reviewed in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 11 and March 18.

On June 5 the General Electric Company made answer in the Circuit Court of the United States for the Northern District of Ohio, this answer being a general denial of the allegations set forth in the Government's petition and prayer, in so far as these allegations may be construed to represent practices of a malicious, overt or deceitful character. It denied that it had been or was engaged in unlawful contracts, combinations or consipracies in the restraint of commerce among and between the several states and territories of the United States in incandescent electric lamps or to monopolize the same, and denied that in participating in the various acts and agreements described in the petition it had been actuated by unlawful intent to restrain interstate trade or commerce in selling incandescent electric lamps or to monopolize the same, or that it had been actuated by any intent to monopolize except to the extent of the legitimate monopoly which lawfully follows the exercise of rights and privileges duly conferred upon it by the patent laws of the United States. By virtue of the granting of certain licenses the licensee companies agreed as a condition to the exercise and use of these grants of license to maintain certain prices. Contracts were made with dealers and jobbers in incandescent lamps for the sale of tungsten-filament and tantalum-filament lamps wherein these jobbers and dealers agreed to purchase carbon-filament lamps from the defendant, and insisted that all such contracts were lawful and proper under the laws of the United States and voluntarily made between the parties thereto.

The National Electric Lamp Company was incorporated on May 3, 1901. under the laws of the State of New Jersey. This company issued securities and acquired the capital stock of other companies engaged in the manufacture of incandescent lamps. Subsequent to the organization of the National Electric Lamp Company the General Electric Company acquired 75.2 per cent of the capital stock of this company, and by the contract under which it acquired this interest it secured an option on the remaining stock. Until the filing of the Government's petition, however, the absolute control and domination of the operations of the National Electric Lamp Company were vested in the minority interest, but subsequent to the time the petition was filed the option was exercised and the remaining stock was acquired by the General Electric Company. In the acquiring of the stock of the constituent companies of the National Electric Lamp Company it is understood that the consideration was cash, bonds or notes in every instance, and the entire stockholding of the National Electric Lamp Company is now owned substantially as set forth above.

As has been expected, a decree has now been agreed upon between the attorneys for the lamp manufacturers and the Department of Justice of the United States dissolving the National Electric Lamp Company, prohibiting this company from voting stock or accepting dividends. By the decree the lamp companies are prohibited from selling lamps with an agreement that said lamps are to be re-sold by purchasers at any certain price. Jobbers are to be permitted to buy lamps at whatever price the manufacturing companies make and sell them at whatever price said jobbers may choose. The combination of lamp companies is held to be in restraint of trade within the meaning of the law and the decree is intended to make possible competition between the various lamp manufacturers and between jobber and jobber, and expressly forbids agreements which fix re-sale prices. The decree forbids any restraint upon the purchase of common carbon lamps upon which patents have expired, through the ownership or control of the patents on tantalum and tungsten lamps, the American patent rights of which the lamp companies acquired in 1909.

The companies will be given time to readjust their affairs and announcement will be made later respecting whatever reorganization may be effected.

Missouri Conservation Society.

During the National Conservation Congress at Kansas City, Mo., the Missouri Conservaton Society, having for its object the development of water-power plants along the rivers of Missouri, was organized. Governor Hadley, of Missouri, is president of the society.

According to statistics recently gathered by the Missouri Bureau of Statistics, 500 sites where water power might be developed profitably are going to waste. The wasted water power, the report says, would run all the saw, planing, cooperage and other woodworking mills in the state, while sufficient electricity could be developed to light practically every city in the state.

The Chicago Signal Club.

The Chicago Signal Club has formed a formal organization and adopted a written constitution. The officers are: president, C. G. Stecher; vice-president, W. H. Arkenburgh; secretary-treasurer, A. D. Cloud.

The first meeting under the new organization was held at the office of *The Signal Engineer*, 417 South Dearborn street, on Monday, October 2. Twenty-nine members were present. The subject of signal failures was discussed at considerable length and several experiences from which profitable lessons had been drawn were related.

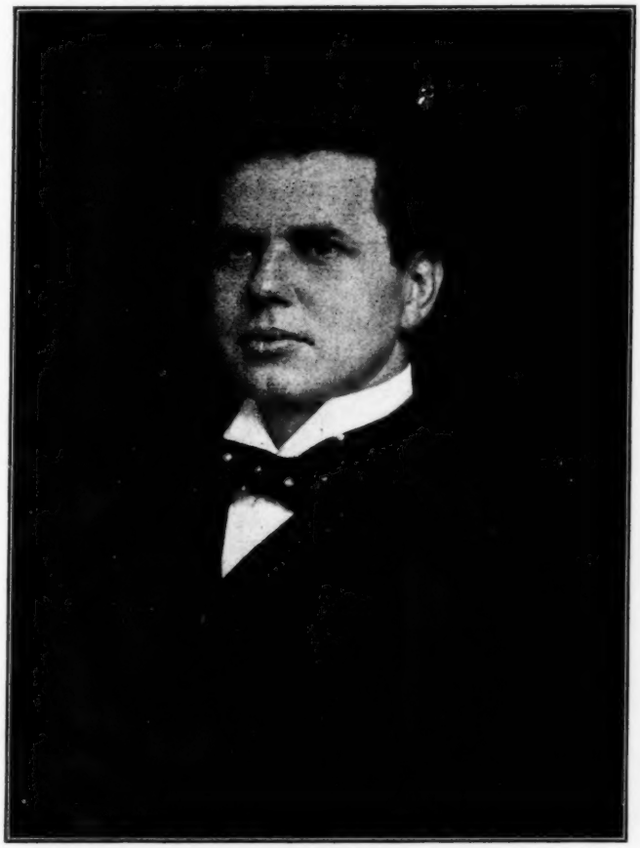
The next meeting will be held on Monday, November 6, at 417 South Dearborn street, Chicago, in the same office.

S. S. Wheeler.

Scholar, inventor and executive, S. S. Wheeler is one of the most interesting figures in the contemporary history of electrical development. For over thirty years he has been intimately connected with the most intensive forward movements in the upbuilding of the electrical industry from an educational, manufacturing and ethical standpoint.

Schuyler Skaats Wheeler, president of the Crocker-Wheeler Company, of Ampere, N. J., was born in New York, N. Y., May 17, 1860, the son of James Edwin and Ann (Skaats) Wheeler. He was educated at Friend's Seminary, Keble Hall, Columbia Grammar School and Columbia College. The degree of Doctor of Science was conferred upon him by Hobart University in 1894. Dr. Wheeler left college in 1881 to become assistant electrician of the Jablochkoff Electric Light Company, remaining there until 1882. Upon the dissolution of this company Dr. Wheeler became connected with the United States Electric Light Company, which at that time was coming into the field with the direct-current arc lamp. He did not remain with this connection long, however, and soon became attached to the engineering staff of Thomas A. Edison and was placed in charge of the work at the first station when it started up in 1882 in Pearl Street, Brooklyn. This was the historic installation of the Edison Electric Light Company, when incandescent electric lighting had its inauguration for commercial service. Dr. Wheeler was not only in charge of operations, but he contributed many of the controlling mechanical and electrical devices that contributed materially to the success of this installation. Later on he erected the station apparatus for the company at Fall River, Mass., and Newburgh, N. Y. He was stationed at the latter place for some time as superintendent of the Newburgh Edison Company. He then became electrician for the Herzog Teleseme Company, and in 1886 was appointed electrician and manager of the C. & C. Electric Motor Company of New York. This was the first institution established for the manufacture of a standard line of small electric motors built upon the same scientific lines of construction that were embodied in the generating apparatus standard at that time. Dr. Wheeler was office electrician and factory manager of the company, and it was due almost entirely to his inventive genius and his ability as a designer that the manufacture of this apparatus was placed on a staple and profitable basis.

Francis B. Crocker was associated with Dr. Wheeler in the development of the electric motor, and these two formed in 1888, the firm of Crocker & Wheeler. The firm later became the Crocker-Wheeler Company, and in 1893 moved from New York to Essex County, N. J. Here a most delightful industrial and residence community has been built up, the station being named Ampere in honor of the great French scientist, the only place in the world so distinguished.



SCHUYLER SKAATS WHEELER,
President of the Crocker-Wheeler Company.

Dr. Wheeler has been president of the Crocker-Wheeler Company since 1889. From 1888 until 1895 Dr. Wheeler was electrical expert of the Board of Electric Control for New York, during which time the overhead wire system of the city was placed underground. During his manufacturing connection, Dr. Wheeler has been very prominent in the development of the electric motor, especially with regard to the direct application of unit motors for the driving of machine tools.

In 1900 Dr. Wheeler purchased in London the Latimer Clark Library, the largest collection of rare electrical books in existence, and presented it to the American Institute of Electrical Engineers, forming the foundation of its great library now reposing in its headquarters in the Engineering Society's Building, New York City.

Dr. Wheeler is an active member of many technical and social organizations. He is a member of the American Society of Civil Engineers, the American Society of Mechanical Engineers, past-president of the American Institute of Electrical Engineers, a member of the Chamber of Commerce of New York, and of the American Association for the Advancement of Science. He is a member of the University, Automobile, St. Nicholas and Somerset Hills Country Clubs. He has been a valued contributor to the technical press, has delivered many addresses on ethical and scientific subjects before the national engineering societies, and is the author with Francis B. Crocker of "Practical Management of Dynamos and Motors."

In 1904 he received the John Scott medal of the Franklin Institute for the invention of the electric buzz fan. He is the inventor of numerous electrical and mechanical devices.

In his presidential address to the American Institute of Electrical Engineers, Dr. Wheeler proposed a code of engineering ethics which has brought out a great volume of commendatory discussion from professional men in every quarter of the globe.

Dr. Wheeler was married October, 1897, to Miss Amy Sutton, of Rye, N. Y., and makes his home at Bernardsville, N. J.

NEW YORK ELECTRICAL SHOW.

GALA OPENING OF BIG ELECTRICAL EXPOSITION IN NEW YORK CITY, WEDNESDAY, OCTOBER 11.

The New York Electrical Show, which is being held in the Grand Central Palace, New York City, from October 11 to October 21 was opened auspiciously on Wednesday evening. There is a full complement of exhibits of modern electrical apparatus and the public-service companies of both New York and Brooklyn are supporting the enterprise with elaborate exhibits. Industrial applications of the electric drive and special forms of illumination are being shown conspicuously.

Promptly at 3:00 o'clock on Wednesday Thomas A. Edison pressed a button that put in motion the electrical apparatus and flooded the arena with light. The extensive booths of the New York Edison Company, the Edison Electric Illuminating Company of Brooklyn, and the United Electric Light & Power Company of New York attracted the greatest interest. Previous to the opening of the exposition a luncheon was given to several hundred guests on one of the floors of the Grand Central Palace. The New York Edison Company was the host on this occasion. Mr. Edison, full of energy and optimism after his long tour in Europe, was the guest of honor. Among others present were Alexander Humphreys, Nikola Tesla, Robert H. Mather, A. W. Burchard, Nicholas F. Brady, Henry L. Doherty, Don C. Seitz, George B. Cortelyou, Edward H. Johnson, T. C. Martin, John F. Gilchrist, W. H. Blood, Jr., Thomas E. Murray, W. G. Bee, Arthur Williams, Charles Kirchoff, W. H. Tolman, Frank L. Dyer, Charles Blizard, A. E. Clifford, E. H. Meadowcroft.

John W. Lieb, Jr., of the New York Edison Company, presided and toasts were responded to by George B. Cortelyou, Charles Kirchoff, Frank L. Dyer and Charles W. Price. Mr. Dyer responded for Mr. Edison, acknowledging the gift presented to him of a copper cube weighing 486 pounds by the copper users and producers of the United States, the presentation being made by Mr. Kirchoff. This copper cube and the first piece of copper wire laid underground by Mr. Edison at Menlo Park for his first central-station installation in 1879, and shown on this occasion, will remain on exhibition during the continuance of the electrical show.

The United States Navy Department is making an extensive exhibit and an interesting display has been prepared by the Electrical School of Brooklyn Navy Yard. This consists of wireless telegraph apparatus demonstrating the methods of instructing the navy operators and there is also a panel board working in conjunction with a set of signal lights such as are used on battleships which are used to flash signals between the vessels of a fleet at night. The Commissary Department of the Navy is exhibiting a complete equipment of electrical utensils for the preparation of the food supply and the exhibit is a duplicate of the galley and mess-room of a battleship. The wireless station of the Navy Department forms the receiving station for the incoming service for the electrical daily being printed during the exposition. The type-setting machines, presses and incidental apparatus are all motor-driven.

Annual Meeting of American Electric Railway Association and Affiliated Organizations, Atlantic City, N. J., October 9-13.

The convention of the American Electric Railway Association and the affiliated accountants, engineering, claim agents and transportation and traffic associations, was held at Atlantic City, N. J., from October 9 to October 13, inclusive. This convention was the largest, most important in the history of the American Association, and the largest convention ever held in Atlantic City. The keynote of the convention, as sounded by President Brady in his opening address on Tuesday, and by the principal speakers who followed him on the subsequent days of the meeting, was the necessity for establishing policies leading to better relations between the railways and the public.

President Brady said, in part, in his address: "During many years the practice of public-service corporations has been to observe silence as to all their affairs. There is little cause for wonder that, as a result of this practice, taken in connection with some cases of serious corporate abuse, the public became imbued with suspicion and distrust. There were formed prejudices and misconceptions against which we must now contend. The part of wisdom is to lay our case fully and fairly before the public, as the tribunal to which we must appeal. It is essential that we do this. We must demonstrate to the people the fallacies which underlie some popular doctrines which are working to the disadvantage of the public no less than to our own loss. We railway men must rid ourselves of self-complacency and realize that we shall have ourselves to blame if we permit a wave of adverse public opinion to bear down upon us without a righteous struggle against it."

An address on "The Toledo Street-Railway Situation" was made by Albion E. Lang, president of the Toledo Railway & Light Company. Mr. Lang's speech aroused great interest in the convention.

A stirring address on "Electric-Railway Securities" was made by James G. Cannon, president of the Fourth National Bank of New York. Mr. Cannon emphasized the importance of the railway companies giving the public the full advantage of every opportunity for good service. So long as the public is antagonistic to the interests of the public-service corporations, no matter what the agency which produced this condition of ill-feeling, it will be impossible to expect a generous attitude of mind with respect to franchises or regulation. The people on the whole are not unreasonable, but open to conviction. A policy of publicity, consistently followed, would be a vast help to all.

A full report of the convention will appear next week.

Safety of Electric Lamps Compared with Those Using Gas or Oil.

The German Statistical Office shows that in 1908 the fires in Germany of known origin were caused as follows: 293 by electricity, 878 by gas, and 4,208 by petroleum. Inasmuch as there are about forty million electric lamps in use as against twenty million gas lamps, the contrast is more in favor of electric lamps than the figures indicate. The great superiority of electric lamps is further testified by the fact that the Prussian police regulations absolutely forbid the use of gas, spirit, petroleum, or candles for lighting purposes in theaters and places where the risk of fire is above the average. Modern improvements in wiring methods and devices have made it almost impossible in a well designed and carefully wired installation for a short-circuit to cause a fire.

Transforming Stations of Niagara Electrochemical Industries.—I.[1]

BY A. J. JONES.

Grouped around Niagara Falls are seven hydroelectric generating stations, four of which are on the Canadian side. From these seven stations energy is being used at the rate of 128,000 horsepower for electrochemical purposes, 56,000 horsepower for railway service, 36,000 horsepower for lighting, and 55,000 horsepower for various industrial services, the total being 275,000 horsepower, or about 5.5 per cent of the available power of the cataract. Of this total amount 146,000 horsepower is employed locally in industries that have been attracted to Niagara Falls by reason of the generating stations located there, electrochemical processes forming eighty-seven per cent of this amount and forty-six per cent of the total utilized.

The brief description here given of some of the installations for transforming and distributing this power in electrochemical plants, together with a discussion of the more salient features, it is hoped, may prove of interest. In any event, the rapid progress of the electrical art makes desirable a frequent comparison of notes regarding methods of design and operation.

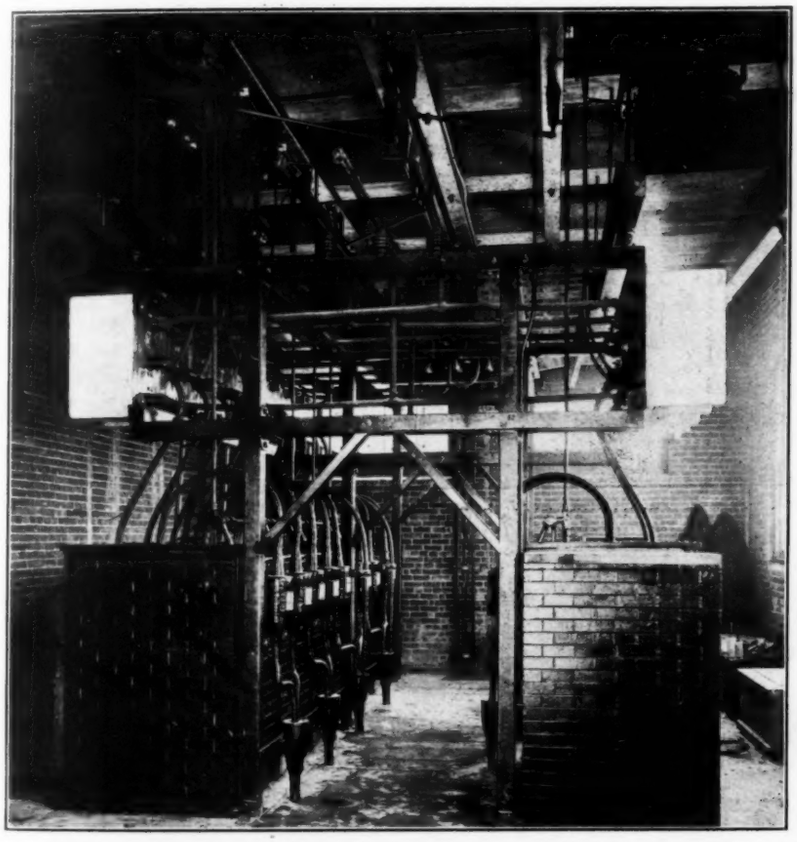


FIG. 1.—SWITCHING APPARATUS IN PLANT OF THE INTERNATIONAL ACHESON GRAPHITE COMPANY.

INTERNATIONAL ACHESON GRAPHITE COMPANY.

The new 11,000-volt sub-station of the International Acheson Graphite Company with a capacity of 2,800-kilowatts, made up of one 1,600-kilowatt and three 400-kilowatt units, is thoroughly modern in all its details.

This station is supplied with power by the Niagara Falls Power Company. Two three-conductor, lead-sheath cables, with provision for a third cable, each capable of transmitting approximately 3,200 horsepower connect this station with the step-up transformer plant of the power company. A second station operated by the International Acheson Graphite Company receives its energy from the same power company but in the form of 2,200-volt, two-phase power. This station is fed by two two-phase underground feeder systems, each system being made up of four 1,000,000-circular-mil lead-sheathed cables with a capacity of 2,000 horsepower per phase.

The switch room of the 11,000-volt station is situated on the west side of the International Acheson Graphite's new furnace room in a two-story brick building with a floor space of approximately 21 feet by 41 feet. On the lower floor are located the switching apparatus, busbars, meter transformers, etc. (Fig. 1). On the second floor are located the switchboards and low-voltage control apparatus.

The incoming power cables enter through a subway which extends the full length of the building. On each side of the subway are erected the masonry cells inclosing the oil circuit-breakers for both the incoming and outgoing circuits. Directly over the subway above the oil circuit-breaker cells is located the busbar structure made of seasoned maple. Disconnecting switches mounted on porcelain insulators fastened to marble slabs are bolted to each side of the busbar structure. Suspended from the ceiling in line with the disconnecting switches are two platforms containing meter transformers.

Each incoming power cable terminates in a brass pothead; thence passes through current transformers to the oil switch; thence to disconnecting switches to the busbars. The oil switches are of General Electric make, 15,000-volt, of 300-amperes capacity, operated from the switchboards above.

There are four switchboard panels of blue Vermont marble 7 feet 6 inches high. One panel 30 inches wide controls the three incoming cables. On this panel are mounted two watt-hour meters which measure the total power delivered to the busbars, a bracket-type voltmeter and time-limit relay of the bellows type. The other three panels are 20 inches wide and control the 1,600-kilowatt unit and two 400-

[1] Paper presented before recent meeting of the American Electrochemical Society in Toronto, Canada, slightly abridged.

kilowatt units, the third 400-kilowatt unit being located in a separate building with its switching apparatus in the same room with the transformer. On each of the unit panels are mounted an ammeter, indicating wattmeter, special voltmeter for indicating the position of the secondary switch, a secondary voltmeter, watt-hour meters and control switches for operation of the regular switch.

The regulator transformers are located a short distance from the switch house in separate bays and are fed by a duplex, lead-sheathed cable. The oil circuit-breakers that control the transformers are of the same type as the circuit-breakers on the incoming cables except that they are two-pole instead of three-pole. The selector switches are single pole, double throw, so arranged that the units may be connected to any one of the three phases.

The regulators represent the latest development and are known as the transformer type of regulator. They are oil insulated water cooled with primaries wound for 11,000 volts. The 1,600-kilowatt unit is capable of a voltage variation of 40 to 160 volts, with full output at any voltage. Two of the 400-kilowatt units have a voltage range of 80 to 160 volts. The third 400-kilowatt unit has a secondary voltage variation of 30 to 60 volts. The regulation is accomplished by means of a dial switch which is rotated by an induction motor controlled from the switchboards in the switch room. The rotating switch of the 1,600-kilowatt unit consists of two dials of twenty-two points each mounted on a two-inch marble slab in a dust-proof case. The 400-kilowatt units have single dials of the same number of points as the 1,600-kilowatt unit. As all the regulating is done on the primary side of the transformers, the volts per step are quite high. In order to have this switch meet the heavy duty required of it, manufacturers have arranged two electrically operated switches, or contactors, in series with each half of the rotating switch. These operating switches are so connected to a small contact device on the main switch as to open the auxiliary contactor and interrupt the contact and again close the circuit after it has made contact with any of the various stationary contacts. With this arrangement all arcing is removed to the auxiliary contacts which are made with easily renewable parts.

The arrangement of the 2,200-volt station is similar to the 11,000-volt station just described. The incoming feeders enter through a manhole in the lower floor of the switch house which is situated on the west side of the graphite furnace room. The incoming power passes through oil circuit-breakers, thence through knife switches to busbars mounted on an iron framework back of the switchboard. On the main floor of the switch house, in addition to the receiving panels, there are located four 150-kilowatt oil-insulated, self-cooled transformers with 230-volt secondaries which supply power to the motor circuits; two 17.5-kilowatt, oil-insulated, self-cooling transformers with 110-volt secondaries used for lighting, two oil switches for control of the main units, one 180-kilowatt induction regulator and one five-

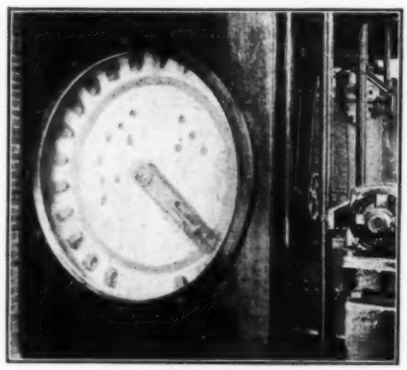


FIG. 2.—MOTOR-OPERATED DIAL SWITCH FOR REGULATION.

kilowatt motor-generator set used for arc lighting and experimental work. On the second floor of the switch house are located three switchboard panels controlling the motor and light transformers and main regulating transformer, also three low-tension panels connected to the low-tension side of the motor and light transformers. The high-tension panels are constructed of blue Vermont marble twenty-four inches wide mounted with oil circuit-breakers, ammeters, voltmeters, and watt-hour meters. The low-tension panels are equipped with knife switches, cartridge fuses, and three-pole, 600-volt, carbon-break circuit-breakers.

There are two regulating transformers used for furnace operation, each with a capacity of 1,600-kilowatt, one manufactured by the Westinghouse Electric & Manufacturing Company and the other by the General Electric Company. They are oil-insulated water-cooled. The Westinghouse unit is capable of a voltage regulation of 80 to 190 volts and is made up of a 180-kilowatt induction regulator in series with the primary of the main auto-transformer. Taps of the main transformer are connected to a series of oil switches which are opened and closed by drum and cam arrangement operated by a small induction motor controlled from the switch room. The main transformer gives a step by step regulation, the regulator being used to vary the voltage gradually between each step on the main transformer.

The General Electric unit is similar to the 11,000-volt units just described except that it has an additional drum switch and is capable of giving a voltage variation of 40 to 200 volts, part of this being accomplished by a motor operated knife switch in the secondary. The accompanying diagram shows the connections of the dial switch and drum switch. The two regulating units are housed in a small brick building in the center of the furnace room. The low-tension busbars are constructed of aluminum and extend the full length of the furnace room.

HOOKER ELECTROCHEMICAL COMPANY.

The power station of the Hooker Electrochemical Company, recently reconstructed and enlarged, presents a good example of concrete construction as applied to switchboard work. The station is located in a brick building with a basement floor. Power enters the building in the form of three-phase, 11,000-volt, twenty-five-cycle current, over two three-conductor, lead-sheath, paper-insulated cables which separate into six single-conductor cables in the basement and thence pass up through the floor to disconnecting switches mounted in concrete cells on the main floor. On the south wall of the building is located the concrete structure which contains the oil switches and busbars. The cells containing the Westinghouse oil switches are built on the floor. Above them are the disconnecting-switch and busbar compartments, the latter running lengthwise of the room. The busbars consist of bare wire, mounted on petticoat insulators. The oil switches are remote control, hand operated, of 300-amperes capacity. The high-tension switchboard panels, six in number, are of blue Vermont marble and are equipped with power-factor meters, ammeters, and switch handles. All the meter trans-

formers are mounted in concrete cells, the low-tension circuits of these transformers being carried to the switchboards in iron conduits.

The 11,000-volt current is stepped down by 300 and 400-kilowatt oil-insulated, water-cooled, single-phase Westinghouse transformers, located in a bay on the north side of the station. The 300-kilowatt transformers have a ratio of 11,000 volts to 198 volts and

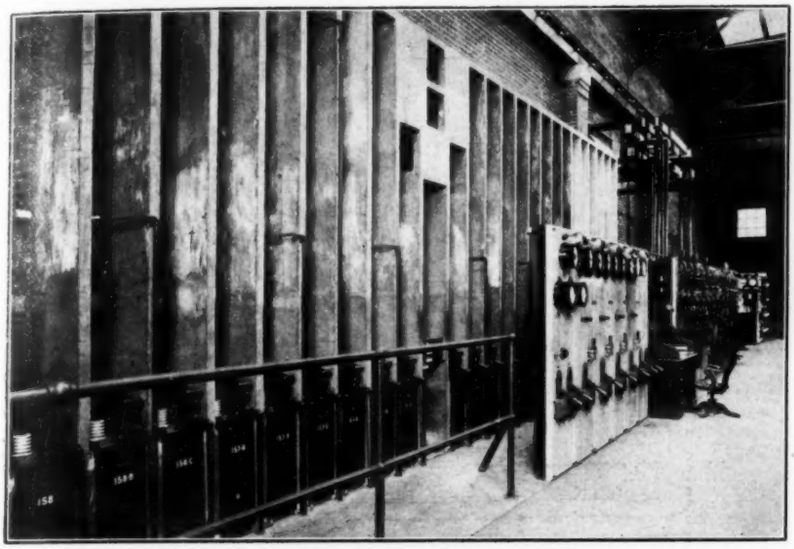


FIG. 3.—SWITCHBOARD OF HOOKER ELECTRO CHEMICAL COMPANY.

are connected in delta, supplying power to rotary converters. Some of the 300-kilowatt transformers are arranged for three-phase to two-phase transformation and have a secondary voltage of 2,200 volts. The 400-kilowatt transformers have a secondary voltage of 220 volts, and are used for lighting and motor power.

Direct current is obtained from Westinghouse booster-type rotary converters, six phase, 375 revolutions per minute, direct-current voltage 230 to 320; and from Burke Electric motor-generator sets consisting of 720-horsepower synchronous motors, two-phase, 2,200 volts, 375 revolutions per minute,

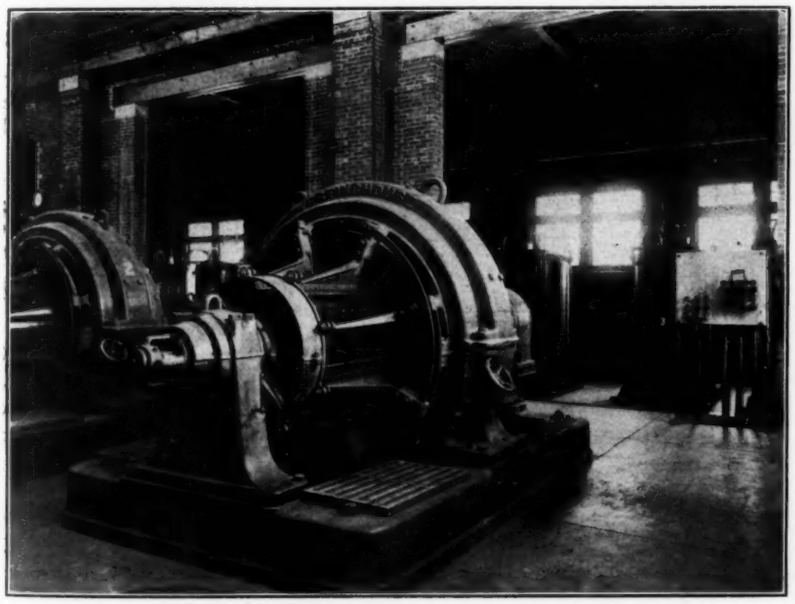


FIG. 4.—BOOSTER-TYPE ROTARY CONVERTERS.

direct connected to 500-kilowatt, 250-volt, direct-current generators, and 360-horsepower, two phase, 2,200-volt synchronous motors, direct connected to 250-kilowatt, 125-volt, direct-current generators, running at 500 revolutions per minute. The synchronous motors are excited by two Burke Electric exciter sets consisting of a ninety-horsepower induction motor, direct connected to a 60-kilowatt, 125-volt, direct-current generator. All the machines in the station are arranged so that they can be operated in multiple on the direct-current-side, a direct-current busbar being carried along the rear of the low-tension switchboard. Each machine is controlled by a low-tension panel which is equipped with circuit-breakers, knife switches and ammeters. The Burke Electric machines are controlled on the 2,200-volt side by panels equipped with oil switches.

The low-tension circuits of the motor and light transformers are carried to six panels mounted with four-pole knife switches and cartridge fuses. A 2,200-volt receiving panel through which power was formerly supplied to the Burke machines is still in service, being used as a spare. The rotary converters are synchronized by small induction motors mounted on the end of the shaft. A low-tension starting panel, mounted with two three-pole knife switches, is connected in the circuit between the transformers and alternating-current side of the converters. All of the 11,000-volt apparatus was furnished and installed by the Westinghouse Electric & Manufacturing Company.

THE UNITED STATES LIGHT & HEATING COMPANY.

Located in the north end of the city of Niagara Falls is the United States Light & Heating Company, which has just completed a new transformer station designed by Dodge, Day & Zimmerman of Philadelphia. When completed the station will contain four 750-kilowatt rotary converters, with necessary step-down transformers; two sets have already been installed.

At the present time power is received from the Cliff Electrical Distributing Company by an overhead transmission line which will soon be replaced by an underground cable system. Power enters the station in the form of three-phase, twenty-five-cycle current, at a pressure of 12,000 volts, and passes through General Electric disconnecting switches mounted on insulators on a pipe framework adjoining the south wall of the station. On each side of this iron structure are mounted meter transformers and fuses. From the disconnecting switches circuits are car-

ried overhead to choke coils located on a pipe framework mounted on top of a three-pole, cell-type 15,000-volt, oil circuit-breaker. From this support the circuits pass through the oil switch to a busbar system mounted directly over the static transformers supported on insulators on an iron framework.

In front of the large, oil circuit-breaker stands a blue Vermont marble panel equipped with Thomson horizontal-type ammeter, wattmeter, power-factor meter, time-limit relay, and switch handle. General Electric meter transformers are mounted on the framework above the oil-switch cells.

In the rear and at right angles to the main oil-switch structure facing in opposite directions, are two additional brick structures containing automatic, remote-control, three-pole 15,000-volt, General Electric oil-switches, which control the primary circuits of the static transformers. Above each cell is a pipe frame work on which are mounted meter transformers.

From the main-line oil switch the current divides and passes through each of the two oil switches described above to the primaries of the two banks of transformers. Located in front of the switch cells are three marble panels, one of which controls the oil switch, another being a starting panel for a rotary converter, while the third has mounted upon it the neutral circuit-breakers. On the oil-switch panel are mounted Thomson voltmeter, ammeter, power-factor indicator, time-limit relay and switch handle. On the starting panel are mounted a 2,500-ampere, three-pole, double-throw, knife switch, and a 1,200-ampere, three-pole, double-throw knife switch. On the rear of this panel is mounted a three-pole, carbon-break circuit-breaker in the middle point of the secondary winding of the transformers.

Two banks of transformers, each bank consisting of three 275-kilowatt, single-phase, oil-insulated, self-cooled, General Electric transformers, with 6,930-volt primaries, Y-connected, and 199-volt secondaries, step down the current for use in the rotary converters. The secondary leads of the transformers are carried to the starting panels, thence to the rotary converters through underground trenches on single-conductor, lead-covered cables.

The 750-kilowatt, six-phase, split-pole rotary converters with a direct-current voltage of 225 to 275 volts occupy space on each side of the station. The main and auxiliary field rheostats are mounted on angle-iron framework near the rotary converters. Direct-current power from the rotary converters is carried to a switchboard in the east end of the station through underground ducts by single-conductor lead-covered cables.

The direct-current switchboard consists of ten blue Vermont marble panels, 2.5 inches thick, made by the Fort Wayne Electric Works. On the left-hand end, facing the switchboard, are two thirty-inch panels which control the direct-current side of the two rotary converters, each panel being equipped with two carbon-break circuit-breakers, two single-pole, single-throw, 5,000-ampere knife switches, and a 6,000-ampere Thomson astatic ammeter. Next to the rotary panel is a thirty-six-inch panel equipped with three 300-volt Thomson astatic voltmeters, one 10,000-ampere ammeter and two Sangamo watt-hour meters. Two vacant panels come next, which have been reserved for booster controlling switch and instruments. A motor panel occupies the space beside the vacant thirty-inch panel. This panel is mounted with two knife switches, two ammeters and two carbon-break circuit-breakers. An eighteen-inch fire-pump panel joins the motor panel, equipped with an 800-ampere ammeter, two single-pole, single-throw knife switches and two carbon-break circuit-breakers. The eighth panel is an eighteen-inch lighting panel, equipped with a 600-ampere ammeter, two-pole circuit-breaker and a three-pole, single-throw, 400-ampere knife switch. The ninth and tenth panels are what are known as battery panels. These are each equipped with one 3,000-ampere ammeter, one two-pole circuit-breaker and three 3,000-ampere, single-pole, single-throw knife switches.

In the rear of the switchboard are located the copper busbars, three in number, constructed of 10 by 0.25 inch copper bars. Three busbars are required, as the plant is operated on a three-wire system. From this switchboard the power is carried to the shops by insulated copper cables supported on an overhead pole line. The station is served by two overhead cranes of sufficient capacity to handle any unit in the station.

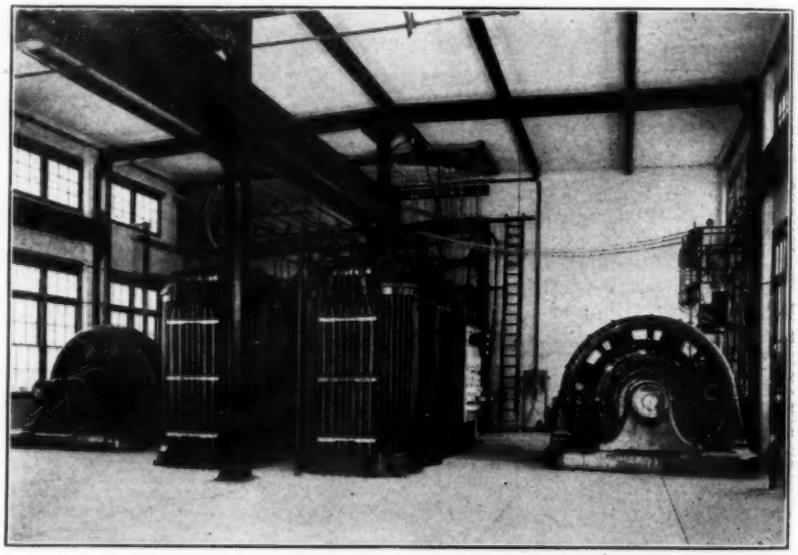


FIG. 5.—ROTARY CONVERTERS AND TRANSFORMERS, UNITED STATES LIGHT & HEATING COMPANY.

NIAGARA ALKALI COMPANY.

The new transformer station of the Niagara Alkali Company will have, when completed, a capacity of approximately 1,500-kilowatts, made up of two 705-kilowatt rotary converters, six-phase, 375 revolutions per minute, direct-current voltage 205 to 235 volts—one manufactured by the General Electric Company and the other by the Westinghouse Electric & Manufacturing Company. The General Electric unit is known as a regulating-pole rotary converter, the direct-current voltage being varied by changing the excitation of the auxiliary poles. The Westinghouse unit regulates the direct-current voltage by a synchronous regulator mounted on the same shaft as

the rotary converter, and connected between the armature windings and collector rings. Both these rotary converters have high synchronizing power and will not drop out of step when the alternating-current voltage is dropped to forty per cent of normal.

Power is received over a three-conductor, 11,000-volt, paper-and-lead covered cable from the Union Street substation of the Niagara Falls Power Company, and stepped down in three-phase 870-kilowatt, oil-insulated, water-cooled transformers to a voltage suitable for the rotary converters.

The high-tension switching apparatus consists of four three-phase, automatic, 15,000-volt General Electric oil circuit-breakers, mounted in cells, constructed of pressed brick ranged along the west wall of the transformer station. One switch controls the main line, the other three are unit switches for control of the two rotary converters and a bank of motor and light transformers. Above the oil-switch cells is an iron-pipe structure carrying the busbars, meter transformers and disconnecting switches. The busbars consist of heavy-insulated rubber-and-cambric cables, mounted on petticoat insulators. Switch handles for operating the oil switches are mounted on the side walls of the brick cells. A main-line disconnecting panel is fastened to the wall directly above a manhole in the northwest corner of the station. Between the rotary converters and transformers are two starting panels, mounted with three-pole, double-throw knife switches. On the east side of the room is a low-tension switchboard consisting of slate panels twenty-four inches wide. Two panels control the direct-current side of the rotary converters, and are equipped with knife switches, circuit-breakers, indicating voltmeter and ammeters. The other panels contain the high-tension indicating meters and watt-hour meters.

In addition to the rotary converters the station will contain two twenty-five-kilowatt and two fifty-kilowatt, oil-insulated, self-cooled, General Electric transformers with a ratio of 11,000 to 460 volts, for motor power, and a lighting transformer of fifteen-kilowatts capacity, oil insulated, self cooled, made by the General Electric Company, with a secondary voltage of 115 to 230 volts. All the low-tension wiring is carried underground in fiber conduit. An overhead crane of ten tons capacity serves the station. A pit is excavated in the northwest corner of the station, so that transformers can be readily dismantled and repaired.

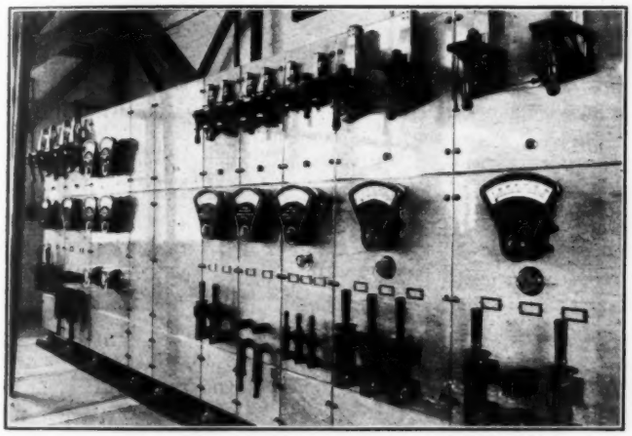


FIG. 6.—DIRECT-CURRENT SWITCHBOARD.

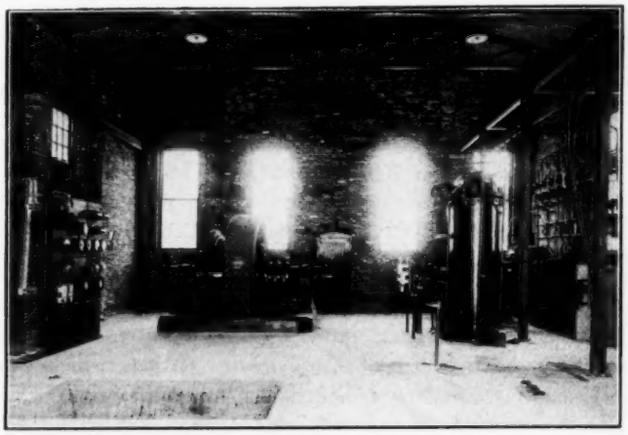


FIG. 7.—TRANSFORMER STATION OF NIAGARA ALKALI COMPANY.

THE ALUMINUM COMPANY OF AMERICA.

Electrical energy is supplied the Aluminum Company of America at its No. 1 Niagara Works by the Niagara Falls Power Company, delivery being made at three stations known as 1A, 6A, and 10A. These stations are designated by the number of the buildings in which they are located and are of two classes, one containing rotary converters, the other regulating transformers.

The rotary-converter station is of interest as being the first station to receive power from the Niagara Falls Power Company. Power was first delivered to this station in August, 1895, since which time it has been in continuous operation with very few interruptions. The equipment consists of 600-kilowatt General Electric rotary converters, two phase, twenty-five cycle, running at 187.5 revolutions per minute, some of which are located on the west side of the station and others on the east side, the middle section of the station being occupied by banks of air-blast, step-down transformers. The transformers are single phase with 2,200-volt primary, and are supplied with air by two blowers driven by direct-current shunt motors located on the floor of the station. A subway is carried under the transformer which conducts the air from the blowers to the transformers.

Alongside of each bank of transformers and in line with the rotary shaft is a switchboard panel which controls the primary and secondary circuit of each bank. This panel is equipped with four 2,000-volt knife-switches, without barriers, mounted at the top of the panel and four low-voltage knife switches mounted at the bottom.

The direct-current side of the rotary is controlled by a panel provided with knife switches, field switch and field-rheostat handle. All of the rotaries are connected on the direct-current side to a busbar, supported on an iron framework on the west side of the station, the leads from the two rotaries on the east side being carried under the floor in a subway.

In the north end of the station are the receiving panels, two in number, one of which is equipped with single-throw, single-pole knife switches, the other with two automatic double-pole, 1,500-ampere Westinghouse oil circuit-breakers. These panels are made of asbestine stone and are mounted side by side on an angle framework. The incoming power cables enter through a subway and manhole under the receiving panel. They are single conduc-

tor, lead sheathed, with a cross section of 1,000,000 circular mils each.

Transformer station 6A is located in a two-story brick building tacked on to the south wall of the carbon-furnace plant. In this building are located the switchboards and control switches for six regulating transformers located in transformer houses in the furnace room. On the ground floor is an asbestine stone panel to which are connected six 1,250,000-circular-mil single-conductor, paper and lead cables constituting a two-phase and a single-phase feeder system. From the disconnecting panel the cables pass up to a marble panel on the second floor, mounted with two double-pole, remote-control, automatic Westinghouse oil circuit-breakers and necessary meters. A two-phase busbar system in the rear of the switchboard receives the current after it passes through the oil circuit-breakers.

In addition to the receiving panel there are five unit panels and one direct-current control panel. The unit panels are equipped with meters and oil switches, the disconnecting switches being mounted on a framework in the rear of the panels with the master switches controlling the units located in front.

The regulating transformers are located in dust-proof brick houses at distances varying from 50 to 200 feet from the switch house. They are known as the unit-switch type of potential regulator, the electrically operated switches being of the open type, mounted on marble panels. The control voltage is 110-volts direct current and is supplied by a small motor-generator set in the switch house.

Across the street from the carbon plant is located building No. 10, containing transformer station 10A. A small brick structure located in the center of the building houses the switchboards and transformers. The transformers are located in the basement and consist of two 1,000-kilowatt oil-insulated water-cooled General Electric transformers. One transformer is used for experimental purposes and has a range of 30 to 77 volts. The other transformer is used in conjunction with an induction regulator and is capable of giving a voltage variation of 45 to 60 volts.

The switchboard panels are located on the main floor, and consist of an incoming feeder panel and four unit panels, one for each transformer and regulator and one for motor transformers. The receiving panel is located along the east wall of the building and is equipped with knife switches and oil circuit-breakers. The other panels are equipped with oil circuit-breakers, ammeters and wattmeters.

A two-phase, underground-feeder system tapped to the same feeder that supplies station 6A enters the basement and connects to the receiving panel.

THE CARBORUNDUM COMPANY.

The main transformer station of the Carborundum Company is located in a rectangular brick building situated in the west end of the furnace room. In this building are located switchboards, water rheostats, two small motor-generator sets and two regulating transformers. Power is supplied to this station by ten single-conductor, lead-sheathed, underground cables, each having a cross section of 1,250,000 circular mils, which connect to the No. 2 generating station of the Niagara Falls Power Company.

In the east end of the station facing each other are located the two regulating transformers with their control panels. Along the south wall about four feet apart are four switchboard panels which control transformers located in bays in the furnace room and in the northwest corner of the station is a two-phase motor panel.

The switchboard panels are standard single-phase panels, twenty-four inches wide, constructed of slate, made by the Westinghouse Electric & Manufacturing Company. Each panel is equipped with an automatic, two-pole circuit-breaker, knife switches and meters. Above each panel on the wall are water rheostats consisting of an iron tank lined with a section of sewer tile twenty-four inches in diameter.

The regulating transformers are four in number. They are of the oil-insulated, water-cooled type, each with a capacity of 1,600-kilowatts, 80 to 300-volt secondary. Two of these regulators, as mentioned before, are located in the transformer station, the other two being located in transformer houses in the furnace room.

The regulators are what is known as a unit-switch type of potential regulator, being of special design for handling heavy currents. The regulator consists of a number of electrically operated switches controlled from a master switch located in front of the control panel. The transformer windings are divided into sections and two floating coils are provided which are connected to various taps on the main auto-transformer. These floating coils have intermediate steps and the successive operation of the switches connect the floating coils in proper sequence to the main auto-transformer and transfers the line connection from one point of the floating coil to the next. The master switches are arranged with an automatic lock to prevent their being opened too rapidly. The magnet switches themselves are so interlocked that the proper sequence of operation is insured. The main contacts are oil immersed and entirely inclosed, making them dust proof.

Low-voltage control cables in underground ducts connect the master switch to the regulator, the control current being supplied from the two small motor-generator sets located in the transformer house.

In addition to the regulating transformers the Carborundum Company operates two 1,500-kilowatt oil-insulated, water-cooled transformers with 2,200-volt primary and 100-volt secondary, manufactured by the Westinghouse Company. These units are connected to panels in the transformer room. There is no receiving panel in the station, each single-phase circuit connecting directly to a single-phase transformer panel. Motor power is obtained from a bank of transformers located in a shed near the furnace room.

The No. 1 plant of the Carborundum Company is supplied from a small step-down transformer station in the basement of the mould building, consisting of two 150-kilowatt and six fifty-kilowatt transformers, oil insulated and self cooled, made by the General Electric Company and one seventy-five-kilowatt, oil-insulated, self-cooled Wagner transformer. The seventy-five-kilowatt transformer is used for lighting and has a ratio of 2,200 to 110,220 volts. The other transformers supply power to motors and have 440-volt secondaries. A two-phase standard Westinghouse panel controls the incoming power, which is supplied from No. 1 generating station of the Niagara Falls Power Company by two duplex paper-and-lead cables.

NIAGARA LEAD COMPANY.

The transformer station of the Niagara Lead Company, situated in the

south end of the main building, is supplied with power by the Niagara Falls Power Company by a two-phase, 2,200-volt underground-feeder system, consisting of two duplex paper-and-lead cables.

The incoming cables connect to a receiving panel mounted with four disconnecting switches and two two-pole, automatic Westinghouse circuit-breakers. From the receiving panel the power is carried to the motors and transformers by conductors mounted on the walls on porcelain insulators.

Direct-current is obtained from two Westinghouse motor-generator sets, each consisting of a 300-horsepower, two-phase, 2,200-volt, induction motor, direct-connected to a 187.5-kilowatt, 125-volt, compound-wound, direct-current generator, running at 487 revolutions per minute. In addition to the motor-generator sets the station contains a sixty-horsepower, two-phase, 2,200-volt Westinghouse induction motor belted to an overhead line shaft, which supplies the main shop with mechanical power. This motor is protected by a panel mounted with expulsion-type fuses.

On the west wall of the station are mounted two fifteen-kilowatt, oil-insulated, self-cooled, and four five-kilowatt, air-cooled, Westinghouse transformers, with 110-volt secondaries used for lighting. These transformers are also protected by expulsion fuses.

Each motor-generator set is provided with a motor and generator panel. The panel controlling the motor is located on the east side of the station between the wall and induction motor; ammeters, an oilswitch, auto-starter, and four-pole air-break circuit-breakers are mounted on the panel.

The direct-current panels are located on the opposite side of the room near the west wall. Each panel is equipped with meters, field-rheostat handle, knife switches and circuit-breakers. The direct-current power is carried to the cell room by underground cables.

(To be continued.)

Power Plant Dismantled.

The pioneer generating plant of California, on the Yuba River, near Nevada City, is being dismantled. The plant, known as the Rome Power House, is now the property of the Pacific Gas & Electric Company, and has not been in use for considerable time. The equipment will be sold.

PATENTS AND POOLING ARRANGEMENTS.

ADDRESS BEFORE CHICAGO ELECTRIC CLUB.

The patent situation in the United States, with special reference to pooling arrangements, legal and unlegal, coming under the scope of present patent laws, was interestingly discussed by Charles A. Brown, patent attorney of Chicago, at the meeting of the Chicago Electric Club on Wednesday, October 11.

Mr. Brown called attention to our present laws in relation to patents which grant the patentee a monopoly on his invention for seventeen years, without stipulation as to how this monopoly should be exercised. Attention was also called to the Sherman law, passed in 1890, which provides that any monopoly in restraint of trade is illegal. The speaker referred to the delicate distinction between these two laws and added that the monopoly granted by right of a patent must be conducted without conflicting with existing laws.

Speaking more in detail of the broad rights granted by a patent, Mr. Brown said that the patentee is allowed to license any number of parties or companies to use such patents under any conditions to insure a monopoly. In this connection Mr. Brown mentioned the condition at present existing in the shoe industry. The patentee of the machine used for fastening buttons to shoes licenses companies to use this machine only under the condition that the button fasteners, not patented, be obtained from the patentee.

Mr. Brown also referred to several decisions handed down in patent litigation cases, relative to pooling, showing the conflicting nature of these decisions. As yet the Supreme Court of the United States has not rendered a decision.

A. D. Curtis asked Mr. Brown if congress had not recently revised the patent laws granting more power to patentees. In reply Mr. Brown said that minor revisions are frequently made but no important change has taken place since the establishment of the law. Bills are frequently introduced, however, which aim to completely revise the patent situation but no action has ever been taken on these.

Donald Carter spoke of the difficulty of obtaining legislation in patent litigation. He upheld the present patent law and said that the government should rightfully grant monopolies to patentees.

Frederic Vose asked as to the difference between the American and German patent systems. Mr. Brown said that the latter has copied many of the distinctive features of the American system, the principal one being the rigid examination of a patentee's claims. As regards monopolies, Mr. Brown said that Germany encourages pooling, but subjects the monopolies to the strictest supervision.

Philip S. Dodd, of Cleveland, spoke briefly regarding co-operation in the electrical industry. He mentioned the greater co-operation which is possible in the organization of the Sons of Jove and which could greatly benefit the industry. He spoke of the work of the Commercial Section of the National Electric Light Association, calling attention particularly to the co-operation which is being obtained with central-station men, manufacturers, contractors and jobbers. This co-operation is benefiting the entire electrical fraternity and has made possible the issuance of two important and valuable data books —one dealing with electric signs, and one with electricity in the home. The former has enjoyed a circulation of 10,000 copies and the latter over 40,000 copies with prospect of an additional 60,000 being issued. In conclusion Mr. Dodd spoke of the co-operative electrical advertising being carried on in Cleveland and elsewhere and urged that electrical interests in Chicago inaugurating a similar scheme.

H. H. Rogers, of Chicago, spoke briefly in favor of co-operative advertising and called attention to a few of the general principles to be adhered to in newspaper advertising.

H. H. Cudmore, of Cleveland, also spoke in favor of co-operative advertising as outlined by Mr. Dodd and urged the Chicago Electric Club to take active steps in starting such a scheme.

A. A. Gray emphasized the importance of co-operation and the necessity of advertising electrical necessities somewhat commensurate with the extensive advertising of non-electrical necessities.

A motion was passed to refer the question of co-operative advertising in Chicago to the Board of Managers.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA.

SECOND ANNUAL CONVENTION IN NEW YORK CITY.

The second annual convention of the Electric Vehicle Association, of America, met at the Engineering Societies Building, 29 West Thirty-ninth Street, New York City, at 10 o'clock Tuesday, October 10, President W. H. Blood, Jr., in the chair. There were about 100 members present, and the number considerably increased during the day.

Proposed amendments to the by-laws were presented, and then President Blood read his address, as follows:

The Electric Vehicle Association of America today celebrates its first birthday. In one year it has succeeded in enrolling a membership of 200. We should be greatly encouraged by this showing, for our sister organization, the National Electric Light Association was nearly ten years in accomplishing the same results. The increased interest shown in our organization throughout the country enables our Membership Committee to prophesy that our present membership will be at least doubled during the coming year.

The electric vehicle is fast coming into its own. Its achievements are its best advertisement. The prospective purchaser of a commercial electric car no longer asks, "Will it work?" he knows that it will, and now simply wishes to ascertain what it will cost to move a ton a mile and for how many days in the year the truck can be depended upon. It is with little difficulty that the electric-vehicle salesman now proves, to the satisfaction of the purchaser, that the cost per ton-mile for handling merchandise, within city limits, is lower when the electric truck is used than when any other means are employed, and that the electric truck is a far more reliable piece of apparatus than the gasoline truck.

The electric pleasure car is selling itself. Its simplicity of operation, freedom from trouble and cleanliness, to say nothing of its increasing radius of action, recommend it to even the most fastidious purchaser.

It is reported that already there has been invested in this country, in electric trucks, $10,000,000, and in electric pleasure vehicles some $30,000,000, and nearly one-third of these amounts has been spent within the last year. Perhaps some of this sudden impetus has been created by the activity of the Electric Vehicle Association of America.

The elimination of draft-animal transportation and the substitution of motor vehicles is inevitable. The overworked truck horse has no longer a place in our modern civilization or in our congested city streets. If for no other than humane reasons, it must go. During the hot wave last July, in the four cities of New York, Chicago, Philadelphia and Boston, alone, 3,752 horses died of exhaustion. This calamity carried with it a property loss of about $1,000,000. The removal of horses from our crowded city streets would give us at least twice as much room, would reduce the dirt nuisance to a minimum, and would soon relieve us of most of our flies.

The activity of the makers of gas cars, who have taken up the manufacture of commercial trucks during the past year or two, is phenomenal, and sales of cars of this type simply emphasize the almost universal tendency toward mechanically operated trucks. The gasoline and the electric truck are not, in the general sense, competitors. Each has its own field, but the field of the electric is fast widening, and it should be constantly borne in mind that, while the price of gasoline is steadily rising, the price of electricity is constantly coming down. Would a thoughtful business man deliberately install a plant for handling his merchandise if it were shown to him that its annual cost was sure to increase from year to year, or would he not make his investment in such a way as to insure a reduction in operating expense? There is but one answer to this question.

The field for mechanically operated vehicles is almost without limit. Over the streets of Boston alone 25,000 tons of freight are handled, on the average, every day in the year. The amount handled by wagons throughout the country is certainly more than ten times greater than that handled by all of the railroads put together. A rough estimate of the number of power wagons necessary to do the trucking of this country, which can be advantageously handled by electric power, indicates that nearly 3,000,000 such wagons would be required.

It should be the business of the central stations of the country to see that not gasoline but kilowatt-hours are used for this work; it is up to the vehicle manufacturers to place in the hands of the public electric vehicles capable of properly accomplishing the services required of them; it is unquestionably the duty of the electric storage-battery manufacturers to supply rugged and efficient batteries which may be used by any one.

The aim of the Electric Vehicle Association of America is to promote the use of the electric vehicle for business and pleasure purposes. One of our first duties, we believe, is to educate the public as to the advantages of electric propulsion. To do this effectually, a rational publicity campaign has been prepared, and funds for this are now being gathered. But for unforeseen delays this summer we believe that this work would have been well under way. We expect that, with the co-operation of central stations and manufacturers, we shall soon achieve our original purpose. It is hoped that the national advertising will be supplemented by consistent and continuous local advertising, both on the part of vehicle manufacturers and the central stations. The success of this movement depends on the extent of the co-operation secured.

The various committees appointed during the year have all been doing effective work. The standardization of various parts of the electric vehicle, suggested in my first address, has received attention, and had the committee in charge of these matters done nothing more than secure the adoption of a standard charging plug, it would be entitled to great praise. What has been done and what is to be done by this committee will be reported to you during the season. The work accomplished by the Committee on Rates and Charging Stations is worthy of special commendation, and the compilation which will be presented is of great value and it is to be hoped will assist in the establishment of greater uniformity in charging rates throughout the country. An important advantage which the electric vehicle possesses over gasoline cars will be well shown when the report of the Insurance Committee is read. To the Committee on Papers much of the success of the organization is due. The directors of the Association deserve no little credit for their constant attendance at the meetings which have been held almost monthly during the past year and for the cordial support which they have given the president.

Through the efforts of this association the attention of the country has unquestionably been turned toward the electric vehicle, and the usefulness of the Association has been demonstrated beyond a doubt. Its ultimate success will depend entirely upon the extent of the co-operation which it is to receive from central stations, vehicle manufacturers and others interested in increasing the use of the electric vehicle.

A provision in the constitution makes it easy to form branch organizations in centers of local activity, and it is hoped that during the coming year a number of these organizations, similar to the New England Branch, already doing most effective work in the city of Boston, will be formed.

Central stations are at last beginning to realize their opportunities and, besides ordering trucks for their own work, are installing and operating commercial garages until such time as local interests are ready to undertake the work.

A Committee on Education is arranging to establish in trade schools and elsewhere regular courses of lectures and exhibits which will familiarize the young men of the country with the simplicity and efficiency of the electric vehicle, its battery and its motor.

The industry is now well organized, the psychological moment for active work is here. Let us forget that there are competitive makers of electric trucks, batteries and tires, and do all that we can to talk electric vehicles, to use them, to recommend them and to sell them. If this is done in season and out of season, the public will soon learn that for reliability, efficiency and economy it must use the electric vehicle.

Reports of standing committees followed, and were received and placed on file without discussion. Alex Churchward, chairman of the Committee on Standardization, suggested that from twenty-eight to thirty-two cells be the standard for pleasure vehicles, and from forty to forty-four for commercial vehicles.

Papers were then read, the program including a night session at which the papers by Hayden Eames and E. S. Mansfield were read, the latter being supplemented by interesting motion pictures. Abstracts of the papers follow. A paper by S. C. Harris on "Vehicle-Battery Practice in Central-Station Companies," is given elsewhere in this issue.

ELECTRIC VEHICLE COMMERCIAL PROBLEMS.

BY R. L. LLOYD AND JOHN MEYER.

Several pertinent electric-vehicle problems are discussed in this paper, these including organization, salesmen, co-operation, advertising, voltage, garages, metering and rates. Under organization it is suggested that a sales engineer or "transportation engineer" be employed by the central-station company to take charge of the electric-vehicle department. He should have a corps of assistants and advice should be given, without charge, to all electric-vehicle owners in case of trouble. Co-operation with electric-vehicle companies' salesmen is urged. These men should be made familiar with the policy of the central station in the territory in which they operate. In connection with advertising it is urged that the central station make liberal use of local means. National advertising is discouraged as being an electric-vehicle manufacturers' proposition. Co-operative advertising with the manufacturers is, however, advocated. Regarding voltage it is stated that in direct-

current systems it is difficult to maintain a steady voltage and manufacturers of batteries and motors should take this fact into consideration. An attempt should not be made to alter the system to suit the battery, rather the battery should be made to suit the system. The importance of properly equipped garages is emphasized. Regarding location, it is thought that generating and substations are not very suitable as charging stations as is frequently advocated, as they are generally situated as regards the central-station system and not automobile or travel centers. It is suggested that central stations establish garages and then turn them over to outside parties when on a paying basis. In cities of such a size that one large garage will be sufficient, the central station could profitably continue in the business. Regarding metering the paper states that there should be no question as to whether the current should be metered on the direct-current side or not. There is no more reason for metering it on the direct-current side than there is for metering the current of a generator, of a motor-generator set or the light-giving portion of current for arc lamps. Regarding rates the authors state that no uniformity can exist as advocated at the last National Electric Light Association. While the rate for charging should be made as low as consistent, no discrimination should be made.

AN ACCOUNTING SYSTEM FOR ELECTRIC TRUCKS.

BY E. W. CURTIS, JR.

This paper is divided into three sections, dealing with (1) the present condition in the industry as regards motor-truck accounting, (2) a discussion of the necessity of proper accounting as suggested by a careful study of the conditions, and (3) a bookkeeping system for motor trucks. It is recommended that all electric-truck records be classified under the following three heads: Maintenance, operation and performance, and a complete list of subjects coming under these classifications are given. Samples of various records, such as the driver's record, charging record, weekly battery report, tire record, inspection report, etc., are reproduced and detailed information given as to the keeping of these.

THE CENTRAL STATION BACK OF THE ELECTRIC VEHICLE.

BY E. S. MANSFIELD.

This paper describes very fully the campaign of education for the introduction of the electric vehicle in which the Edison Electric Illuminating Company, of Boston, is now engaged. The campaign has been in progress since February 25, 1911, and the Edison Company is very well satisfied with the results. The campaign was actively started on February 25, 1911, when a telegram was sent to all manufacturers of electric vehicles advising that $100,000 was going to be spent in an educational campaign and asking their co-operation. On the following day a full-page advertisement was inserted in all of the Boston daily papers by the Edison Company, endorsing the electric vehicle. A constant use of newspaper space followed this initial advertisement. Co-operative advertisements with manufacturers are also frequently run. Electric signs play an important part in the campaign, the company, in addition to maintaining several large ones of its own, furnishes free energy for signs advertising electric vehicles and garages. The Electric Vehicle Club, which was formed under the auspices of the Edison Company, is an important adjunct to the business. This club meets every Wednesday and discusses pertinent electric-vehicle problems. The paper describes the electric-vehicle garage that the Edison Company erected. Booklets are constantly being circulated setting forth the advantages of the electric. A business representative employed by the company is actively engaged in seeking out prospects and reporting them to local agents. An inspection staff is maintained to give advice to vehicle owners in case of trouble. Catalogs and information concerning the various vehicles, batteries and charging apparatus, the cost of current and economy of operation may be had by any one interested. A complete list of charging stations in Boston and vicinity is being compiled and these will be shown on a map to be distributed by the company.

PROPER ILLUMINATION OF THE ELECTRIC GARAGE.

BY J. G. HENNINGER.

Mr. Henninger's paper shows the importance of getting good illumination in the garage, both by day and night. The former can readily be improved by having long windows affording light to all parts of the vehicle. Artificial lighting for all parts of the garage is considered. If a salesroom is connected with it this should be attractively and yet effectively lighted, so also the office of the establishment, care being taken in all cases to prevent bare light sources coming into the range of vision. For the general service room only general illumination of low intensity is required. At the wash rack copious lighting is needed not only above but below the vehicle. The repair rooms also must be generously lighted, since the slight additional expense thereby incurred is more than repaid by the higher efficiency of the workmen. Considerable attention to the matter of reflectors is necessary; for office and salesrooms glass reflectors are preferable, for service and workrooms metal reflectors are excellent. The lighting of private garages needs practically as much attention. The author summarizes the principles of garage lighting as follows: There should be plenty of light. The light-sources should be properly arranged. They should be equipped with proper reflectors. The switches should be sufficient in number and properly located. There should be a number of outlets for portable lamps and tools. The interior of the building should be finished in some light color. The window area for daylight should receive careful consideration. The light units must be kept clean.

IMPEDIMENTS TO THE GENERAL INTRODUCTION OF POWER WAGONS.

BY HAYDEN EAMES.

One of the chief impediments to the more general introduction of the power wagon, discussed in this paper, is that of applying the same to a delivery route previously operated by a horse wagon of the same size and limiting it thereto. The difference in the actual cost of operation between a given size of horse wagon and a given size of power wagon is seldom in favor of the latter, and this is true also of the first cost. The principal economical virtue of the power wagon, therefore, lies in the character of labor-saving machine. Under almost all conditions the price of drivers is the largest single item of expense. The problem of the successful use of the power wagon, therefore, lies in the question, "How much goods can be delivered per man per day?" Several incidents are recounted showing how this question is lost sight of. The next important impediment to the introduction of the power wagon is the hesitancy on the part of users to revise the loading and handling methods used with horse-drawn vehicles. Several examples of this condition are mentioned. The whole question of the rapid introduction of power wagons today is one of education.

THE BATTERY TRUCK CRANE AND ITS APPLICATIONS.

BY R. H. ROGERS.

A new battery truck crane designed to lift, carry and pull is described in this paper. The truck is particularly adapted for handling package freight and is a combination of hoist, crane and vehicle all of stable design and conveniently arranged. The vehicle is a one-ton storage-battery truck, made very short and having the battery mounted on the top of the frame at the rear end. The wheels are made smaller than normal, and a greater speed reduction to the drive wheels is employed to insure a high draw-bar pull when used as a tractor. The battery motor and controller are of the standard type and as a vehicle the handling presents no new features. A crane, equipped with special attachments, arranged to swing 180 degrees is mounted on the extreme front of the vehicle. The electric hoist is a compact weatherproof motor, controller gears and drum in one unit, capable of lifting one ton twenty feet per minute, handles thirty feet of cable and takes its current from the vehicle battery. The practical time, money and space-saving applications of this truck are discussed by the author under the headings of hoisting, hoisting and carrying on the hook, and towing trailers. The manner of using the machine is also discussed in detail.

THE ELECTRIC VEHICLE IN SMALLER CITIES.

BY F. H. GOLDING.

The electric-vehicle situation in Rockford (Ill.) is briefly outlined in this paper and the attitude of the central station discussed. Mr. Golding prefaces his paper with the statement that the introduction of the electric vehicle has not progressed to a marked degree, in the smaller cities, for three reasons, namely: (1) The central station does not appreciate the value of vehicle charging as a source of revenue. (2) The central-station operator feels that because of some peculiar local conditions, such as grades, paving or character of community, the introduction of electrics into his city cannot be successfully accomplished. (3) A desultory, hit-or-miss campaign has resulted in a few vehicles, but failure to properly instruct vehicle purchasers, and to oversee operation, has caused the vehicle to fail to give satisfaction to the user. In Rockford, although a town of only 45,401 inhabitants, there are over 180 pleasure vehicles in use, with some eighty private charging equipments. The success of electric vehicles in Rockford is in a large measure due to the fact that from the beginning the electric company employed a capable battery and motor man to give assistance and instruction to owners. There has been as yet no commercial-truck business developed on account of the high first cost of the electric as compared with the gasoline truck. Regarding pleasure cars, Mr. Golding states that while gasoline and electrics have had their own particular fields, the improvements in storage batteries making possible a run of upwards of 100 miles on a single charge will make the electric a formidable competitor of the gasoline car in the future. An off-peak charging rate is maintained in Rockford, this being six cents net per kilowatt-hour, with a minimum charge of $1.00 per month for individuals, and four cents net for garages, with the stipulation that the latter resell to their customers for six cents. The enforcement of the off-peak charging rule requires little attention. The annual revenue from vehicle charging is about $11,100, the revenue from private garages averaging $60 per car per year and that from public garages $71 per car per year. The better showing of public garages is due to the fact that a num-

ber of the cars kept in private garages are frequently charged at public stations, and to current used while batteries are being repaired. The average annual cost of operating an electric in Rockford is estimated at $180.

EFFECT OF LOW TEMPERATURE ON THE ALKALINE STORAGE BATTERY.

BY W. E. HOLLAND.

In this paper Mr. Holland reviews some tests made by the Electrical Testing Laboratories, New York, to determine the effect of low temperature of charge and discharge on a forty-cell Edison vehicle storage battery having a normal discharge rate of forty-five amperes for five hours. The battery had previously been used about eleven months. The results showed that there is a critical temperature, varying with the discharge rate, below which the capacity falls to a low value. As soon as the battery is warmed above the critical range, its full capacity is readily obtained. This shows the need of a tightly closed battery box to retain the heat of the battery, if the vehicle is to stand idle in a cold place for a long time. Lagging the box or providing within it a set of lamps or heating units, fed from the battery itself while idle, may be desirable. Charging the battery at low temperature has no effort on its capacity. Intermittent discharges at low temperature are not affected as much as continuous ones. Commenting on this report, Mr. Holland says that cold has no permanent effect on the Edison battery; it does not actually reduce its capacity, but rather its discharge rate. Directly after charge the battery cools very slowly. If the battery is in a non-ventilated box, it cools still more slowly. If the vehicle must be kept in a cold shed, the battery box should be provided with a few heating units or the battery should be given a short boosting charge immediately before use. Very little trouble has been experienced from this low-temperature effect in actual practice.

Officers for the ensuing year were re-elected as follows:

President, W. H. Blood, Jr.

Vice-President, Arthur Williams.

Secretary, C. E. Firestone.

Treasurer and Assistant Secretary, Harvey Robinson.

Board of Directors: H. H. Rice, Frank W. Smith, P. D. Wagoner, Louis Burr, W. P. Kennedy, Frank L. Dyer, James T. Hutchings, Louis A. Ferguson, W. W. Freeman, F. M. Tait, Hayden Eames, Charles Blizard.

Boston was selected as the place for the next convention, in October, 1912.

Quicksilver Production.

The world's production of quicksilver last year was 3,747 short tons, of which the United States produced 773 short tons. The American production represents 20,601 flasks. Of this amount California furnished 17,211 flasks.

In 1910 only two countries produced more quicksilver than the United States —Italy 882 tons and Spain 1,102 tons.

The total coal production of Kansas in 1910 amounted to 4,921,451 short tons, valued at $7,914,709.

Minneapolis 1912 Show.

With the third annual electrical show of the Northwestern Electrical Show Association about five months away the interest being taken by those who expect to exhibit is unprecedented. The present indication is that there will be nearly three times as many exhibitors and a very much more varied showing than was the case at the 1911 show.

The dates of the 1912 show are March 16 to 23, inclusive. Officers of the Northwestern Electrical Show Association have profitted by past experiences, and it will be the endeavor this year to add to those things which pre-eminently were the drawing cards at former shows and to eliminate those things which were of less interest. The lighting and decorative effects will again be made prominent features, and every inducement will be offered exhibitors to plan their showings with a view to aiding in the general spectacular effects.

There is already great interest shown in the 1912 show by electrical people throughout the Northwest, outside the Twin Cities. Special efforts have been made to interest these people, and it is hoped to make the event of special importance to them.

While it is necessary, in order to attract the masses, to provide amusement features for an event of this kind, the great educational advantages to be derived are to be brought to the fore. The progress made in the electrical world, industrially and mechanically, will be shown in a most emphatic way. The purpose of the 1911 show was this very feature, but the 1912 show will more than ever be made the vehicle to indicate the great advancement in the use of electricity. Thus the exhibits, which will cover a floor space 150 by 150 feet, will cover a wide range of information and instruction. The application of electricity to domestic and commercial life will be shown. In this the housewife, the banker, the butcher, the manufacturer, the mechanic, the farmer, the baker, and in fact everyone in almost every sphere of life, will be greatly interested.

The importance of this show as an educational possibility has been realized by the Minneapolis Commercial Club and a plan has been formulated in connection with which prizes will be awarded for student-manufactured electrical apparatus. Arrangement of details in connection with this contest is in the hands of W. D. Ryan, professor of electrical engineering at the University of Minnesota, and Professors Cook and McClintock, of the Minneapolis and St. Paul public schools. The competition will be open to all students of the Northwest; copies of the conditions of the contest will be sent out soon to students and instructors of schools in six different Northwestern states. Electrical companies in all these towns will be asked to co-operate in extended campaigns of publicity in their various localities, and thus, this feature of the 1912 show will be well advertised.

An added impetus to the 1912 show will be given by four annual conventions of electrical organizations which will be held in Minneapolis during Show Week. The conventions which will be held that week are: The Minnesota Electrical Association, Minneapolis Section of the American Institute of Electrical Engineers, the Minnesota Electrical Contractors' Association, and a Northwestern Rejuvenation of the Sons of Jove.

Bertrand & Chamberlain, architects, have been engaged by Manager R. W. Clark to prepare the plans for the floor arrangements as well as the decorative features. They are making plans for even more elaborate decorative features than were shown at the last show.

There will be musical features again this year, even more elaborate than at the 1911 show. Special features such as demonstrations of high-frequency currents, etc., will also be arranged for. In this connection the Northwestern Electrical Show Association has established a reputation. Last year Hylon T. Plumb thrilled spectators at the show each day with his experiments. At the 1910 show, M. M. Wood, in his lectures and demonstrations, illustrated by working models of the monorail car, gyroscopes, etc., created a great sensation. The special attractions this year will be even more interesting.

The officers of the Show Association are: F. G. Dustin, president; H. J. Gille, vice-president; Walter E. Stephenson, secretary; A. W. Leonard, treasurer; G. J. Cadwell, C. D. Wilkinson and Theodore Hayes, trustees.

Holtzer-Cabot Plant Burns.

The plant of the Holtzer-Cabot Electric Company, at Brookline, Mass., caught fire on October 7, and was almost totally destroyed. The loss was $200,000.

Fall Opening of Automobile Trade in Chicago.

Interest in electric-vehicle matters in Chicago centered in the annual fall opening of the Automobile Trade Association of Chicago during the week of October 7 to 14. In reality this opening is a fall show of 1912 models, the exhibits of cars and accessories being, however, in the various stores instead of a show building.

The great majority of automobile and accessory agencies and salesrooms are located on Michigan Boulevard between Twelfth and Twenty-eighth Streets, known as "automobile row," so that it was very convenient for visitors to inspect all of the exhibits without any unusual hardships. Visitors from the downtown district were conveyed to automobile row in the demonstration cars used by the agencies.

Elaborate decorative schemes were worked out by the co-operative committee having charge of the arrangements, the principal feature being the special lighting of the entire thoroughfare from Twelfth to Twenty-eighth Streets with festoons of electric lights stretched across the street every 100 feet. These festoons each contained forty sixteen-candlepower carbon-filament lamps. This lighting was augmented by four eighteen-foot decorated pillars, at each street intersection, containing four sixteen-candlepower carbon-filament lamps, inclosed in ornamental lanterns, with a 250-watt tungsten-filament lamp, inclosed in a glass globe, on top of each pillar. This arrangement presented a very attractive appearance and was further enhanced by the permanent ornamental lighting on Michigan Boulevard between Randolph and Twelfth Streets.

The stores of the dealers were specially decorated for the occasion, many providing additional lighting features so as to exhibit their products to the best advantage.

Among the new models of electric vehicles shown were those of the Anderson Electric Company, Columbus Buggy Company, the Hupp Corporation, Ohio Electric Vehicle Company, Studebaker Brothers Manufacturing Company, and the Waverley Company. Among the exhibitors of accessories the following firms displayed products of electrical interest: Diamond Rubber Company, American Ever Ready Company, Dolly Electric Company, Warner Instrument Company, Kimball & Company, Remey Electric Company and the Stromberg Motor Devices Company.

To Buy Chicago & Milwaukee Line.

The Committee of Chicago & Milwaukee bondholders will buy in the property at foreclosure sale, probably late in October, thus completing the reorganization in process the past four years. Canadian and English interests, owning a majority of Wisconsin division bonds, will control the management by controlling the new company's stock, but will arrange with Chicago Elevated to yield control by some operating agreement or division of stock whereby an equitable division of earnings is assured.

Arrangements will probably involve the sale of $4,000,000 first-mortgage bonds, retiring receiver's certificates and the floating debt and leaving nearly $2,000,000 for working capital.

Examination for Electrical Assistant.

The United States Civil Service Commission makes the announcement that on November 22 an examination will be held at the regular places to secure eligibles for the position of electrical assistant in the Signal Service at Large, War Department. Men are desired who have had experience in telegraph and telephone engineering, and those applying should also be familiar with the equipment and methods of installation of telephones, storage batteries, motor-generators, auxiliary power switchboards, telephone switchboards, wire and wireless-telegraph apparatus. Persons who have had power experience only are not qualified for this position and will not be admitted to the examination.

The salary is $1,080 per annum.

Copper Exports for 1911.

Copper exports for September were 57,668,800 pounds, as reported by the Custom House, as compared with 71,081,920 pounds for September, 1910. While that total is considerably less than the exports of the last three months, as reported by the Copper Producers' Association, it is only a little less than the monthly average this year of about 62,000,000 pounds.

Exports for this year, estimated on the showing of the eight months to date would be about 750,000,000 pounds or approximately 25,000,000 pounds more than last year

International Society for Testing Materials.

The International Society for Testing Materials will hold its sixth congress in New York City in September, 1912. The first session will convene on September 3 in the Engineering Societies Building.

The last congress was held in Copenhagen, Denmark, in 1909. Twenty-eight countries are represented in the membership of the Society, and the American Society is affiliated with it. It is upon the invitation of the American Society for Testing Materials that the congress is to be held in this country. An organization committee has been formed, of which Henry M. Howe is president and H. F. J. Porter, 1 Madison Avenue, New York, is secretary. The chairman of the committee on papers is F. E. Schmitt, 220 Broadway, New York City, and all papers to be submitted should be in his hands by January 1.

The International Association has hitherto divided its field into three subdivisions, concerned with different classes of material:

Section A, Metals.

Section B, Stone, cement and artificial stone.

Section C, Miscellaneous materials.

At previous congresses the sections were separately dealt with, in three sets of parallel sessions. A similar arrangement will be made at the sixth congress.

The officers of the American Society are urging upon all members the desirability of joining the International Society also, the dues for which are only two dollars, without any initiation fee. The objects of the Society are the development and unification of standard methods of testing; the examination of the technically important properties of materials of construction and other materials of practical value; and the perfecting of apparatus used for this purpose. Applications for membership should be sent to Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

Washington Section Meets.

The Washington Section of the American Institute of Electrical Engineers held its first meeting of the season on October 10 in the Telephone Building. A paper was presented by Frank B. Jewett on "Telephone Transmission Engineering."

THE ELECTRICAL EXHIBITION IN LONDON.

BY OUR LONDON CORRESPONDENT.

On Saturday, September 23, Sir William Preece formally declared the Olympia Electrical Exhibition open. There are very many exhibits of considerable interest, and some of these are indicated in the following notes. There are some 250 firms exhibiting, including about a dozen technical publications.

The London and provincial electrical supply authorities have fitted up stands as a reception room and inquiry bureau for visitors seeking information regarding electricity for all purposes. Demonstrations of electric heating, cooking, ironing and so on are being arranged for.

In the gallery there is a model electric home equipped from garden and garage to bathroom and bedroom with all that the electrical mind can conceive of as adding to the comfort and convenience of life. In the gallery cooking demonstrations are being given.

Before the exhibition closes on October 21, the president, Sir William Preece, will, at a meeting of the Institution of Electrical Engineers at Olympia, read a paper, or give a lecture, on the lessons learned from the exhibits. The Electrical Contractors' Association is going to hold a meeting during the month, and the British Electrical and Allied Manufacturers' Association (lately the National Electrical Manufacturers' Association) will hold its dinner to signalize its reorganization.

An exhibit of special interest is a 50-kilowatt, 100-volt patent homopolar generator running at 3,500 revolutions per minute. This machine has a central pole extending completely round the rotor, with the same polarity throughout, and two similar end poles. The armature conductors, twelve in number, lie in tunnels in the rotor under the central pole, and are connected to a slip ring at each end. The voltage generated is unidirectional and commutation is unnecessary. Mica only is used for insulation in the rotor. Another feature of this exhibit is a model patent homopolar gyroscope wheel which is itself an electric motor, having no working parts whatever except the brushes and supports, so that the whole mass of the machine is available to assist the gyrostatic action. The 50-kilowatt generator is driven by a three-phase slip-ring motor controlled by a patent induction rotor controller, giving infinitesimal gradations of speed, but having no liquid resistances and needing no rotor contacts, the operation being entirely electromagnetic.

A complete group of Ferranti high-tension panels suitable for receiving electric power at a manufacturing works, is exhibited; also an electrically operated high-tension switch is shown capable of switching on and off 10,000 horsepower. Ferranti's also show new-pattern compression-type motor starters and speed regulators, the multiplicity of contacts usual in workshop practice being obviated.

The General Electric exhibit makes an imposing display of almost all electrical lines, including a 475-kilowatt motor-converter (La Cour patents), traction motors, induction motors and a demonstration of the Lancashire reversing motor drive applied to a large planing machine. There are practical demonstrations of the Reyrolle (Price) core balance protective system, a complete coal and ash handling plant, with high-temperature coking stokers and chain-grate stoker of the Bennis type. "Rapid" electromagnetic separators for removal of iron from brass, or other non-magnetic metal turnings, borings, etc., are on exhibit. One type removes iron from rough material, such as destructor-furnace clinker, wood refuse from the breaking up of old ships, tramcars, etc.; another type for the removal of iron where present in small percentage from materials such as potter's clay dust, bedding sand, ground flint, fire-clay, and so on. This separator is provided with an improvement consisting of a collapsible bridge held in position by electromagnets, and a no-current alarm bell. In the event of the current which energizes the electromagnets failings, the iron accumulated on the magnets is prevented from remixing with the clean material by the automatic fall of the collapsible bridge which directs the flow; simultaneously, an alarm bell rings and continues to do so until attended to.

There are, as one would expect, any number of exhibits by all the well-known makers of metal-filament and arc lamps, the Mazda drawn-wire lamp. Holoplane glassware, electric signs, meters, motors and motor-driven tools, switchgear, Westinghouse Cooper-Hewitt outfits and mercury-vapor rectifiers, the Telewriter apparatus, measuring and other instruments, electric clocks, and multitudinous accessories.

Electrically driven vacuum cleaners are a popular line, this branch having shown great development since the last exhibition was held. The Postoffice is demonstrating an up-to-date telephone service, and there is an exhibit of considerable interest showing ancient and modern telegraph apparatus. The Marconi Wireless Telegraph Company has a ship wireless installation The Edison storage battery and Edison's business phonograph are shown by Edison Manufacturing Company, Limited.

Briefly, the exhibition is admirably representative of British electrical industry, and if the public can only be induced to attend in sufficient numbers a complete success is assured.

Electrical Exports for August.

The Bureau of Statistics of the Department of Commerce & Labor, Washington, D. C., has issued its monthly summary of imports and exports of the United States for the month of August. From these statistics the following data relative to the exports of electrical products are obtained.

The figures for August show some improvement compared with the preceding month, particularly in machinery class, but they are rather disappointing when compared with the corresponding month of 1910. The comparative monthly data are as follows:

Month	Electrical Appliances	Electrical Machinery	Total
August, 1911..	$725,145	$666,544	$1,391,689
July, 1911.....	707,214	584,715	1,291,929
August, 1910...	852,958	708,160	1,561,118

The Bureau of Statistics has begun slightly to subdivide the electrical-appliance class, so that the separate figures for August are: Telegraph instruments, $4,615; telephones, $59,385; all other electrical appliances, $661,145.

A summary of the principal countries to which electrical products were sent in August together with the value of these shipments ,is as follows:

Countries	Electrical Appliances	Electrical Machinery
United Kingdom.....	$ 46,467	$ 62,235
Canada	247,122	156,607
Mexico	34,705	98,324
Cuba	41,117	17,520
Brazil	173,582	116,128
Japan	16,029	31,744

The total enrolment of students on October 1 in the various departments at the University of Illinois was 3,620. Of this number, the College of Engineering is credited with 1,206, of which 290 are in electrical engineering.

Electrical Notes From Great Britain.

By Our London Correspondent.

The railless electric traction system which began operating between Bradford and Leeds, in June last, has from the first drawn many deputations from towns far and near which desire to adopt it if they find it suitable. Interest is sure to be further stimulated by the proposal of the Bradford Corporation tramways manager that extensions involving $132,500 on nine miles of the route be carried out.

Mr. Spencer, whose recommendations have been approved by his committee and now only await the confirmation of the City Council, reports that the system has been an unqualified success from an engineering and operating point of view. No serious difficulties of any sort have occurred during the experimental running "such as might reasonably have been expected in connection with a new installation of this description." Points of a minor kind require attention by the contractors under their agreement. One of the most important features of the report is the expression of regret that from the traffic point of view the returns have been less satisfactory than was anticipated. The lack of experience of a crosstown route in Bradford led to the original calculation that a ten to twenty-minute service would be required, but it is found in practice that normal requirements are amply met by a fifteen to thirty-minute service. The extension of route is expected to lead to improved traffic revenue, but the amount is very problematical, though Mr. Spencer believes that with the complete system as now proposed, working expenses and capital charges will be met and leave a reasonable profit.

Important changes have been made in the National Electrical Manufacturers' Association. D. N. Dunlop, who has been prominently associated with the selling side and publishing department of the British Westinghouse Electric & Manufacturing Company for about ten years, has been appointed secretary and he will proceed immediately with the work of reorganization, the opening up of central offices in London, the preparation of a new basis of membership, and so forth. The name has been changed to British Electrical and Allied Manufacturers' Association, Incorporated, and F. H. Nalder (of Nalder Brothers & Thompson) is chairman, with B. Longbottom (Electromotors Limited) as vice-chairman.

The electrical exhibition at Olympia, London, promoted under the auspices of this Association, as were similar shows in 1905 and 1908, at London and Manchester, respectively, will still be in full swing when these notes appear in print. The opening function really took place at the Trocadero Restaurant on Friday evening, September 22, by Sir William Preece, the exhibition president, though the official and formal opening was performed on the following day.

The directors of the Underground Electric Railways Company, of London, report that for the first six months of 1911, the net output of electric energy of the Lot's Road power station was 69,636,800 kilowatt-hours, against 63,627,200 kilowatt-hours in the corresponding half year of 1911. The eighth Parsons turbine is now in operation.

The Municipal Tramways Association held its annual convention at Glasgow on September 27, 28 and 29. J. Dalrymple, the city's tramway manager, delivered the inaugural address, and in addition to a couple of papers on general tramway policy, two others of technical and special interest were read and discussed. One was on the increasingly interesting subject of tramcar meters (prepared by R. G. and J. G. Cunliffe, technical assistants in Manchester Corporation Tramways Department,) the other being a report on tramway track, its construction and maintenance. This report was prepared jointly by representatives of the municipal trolley lines of Glasgow, Manchester and Leeds. The contribution by the Messrs. Cunliffe was from the electrical point of view the subject of chief interest. These authors sought to show the importance of absolute values and the possibilities of obtaining them, the scope and accuracy of the application of relative values, the behavior of the meters under working conditions, and the factors controlling their use as a means of reducing the consumption of energy. Many experiments have led to the following conclusions which were placed before the meeting:

(1) The ampere-hour meter can, with proper supervision, be made to operate with an accuracy of within one per cent, and its corrected values may be employed for the purpose of placing motormen and cars in their correct order of merit, and when corrected for variation of average voltage to the volt-hour meter, its readings give the true energy consumption. (2) If percentage differences between the results of various men are required the corrected values must be used. (3) The watt-hour meter, owing to its greater complicity, more fragile construction, susceptibility to lightning discharges, and greater inaccuracy, is not so desirable or valuable an instrument as is the corrected ampere-hour meter. (4) The time-meter, though very accurate in its measurement of time, cannot be trusted to measure energy within ten per cent, and, if used at all, should only be employed, in conjunction with the energy meter, for purposes of investigation, in which connection it is very valuable. (5) The volt-hour meter is indispensable for many purposes and ought to be employed on all tramway undertakings for the purpose of measuring average voltages. (6) On small undertakings with light traffic, approximately equal savings may be effected in the driving and in the detection of faulty equipments, but, as the congestion increases, the state of the equipments becomes of increasing importance, more especially as regards the feeding and distribution system where the losses are a fraction of the total energy consumption and do not merely affect the consumption of individual cars.

At the annual convention of the Institute of Metals just concluded at Newcastle-on-Tyne, a paper on the electrical conductivity and constitution of alloys was read by Dr. Guertler. Owing to lack of support the autumn meeting of the Iron and Steel Institute, which was due to be held in Italy in October, has been abandoned, and instead a more or less formal gathering will take place in London.

Experiments are now being made by the General Post Office authorities for

supplementing the present telegraph cables between England and the Continent by means of wireless telegraph working from the roof of the London Telegraph Department. The engineer-in-chief (Major O'Meara) will report to the Postmaster General the result of the trials before anything of a permanent nature is done. The trials are not limited to Continental working. One of the other objects of the present move to make immediately available full facilities for trying any wireless inventions and ideas that are submitted.

Interesting references to the question of obsolesence are made in the recent reports of the city electrical engineer of Salford, and of the city tramway manager and engineer of Newcastle-on-Tyne. At the former place the old boilers ought, in the engineer's opinion, to give place to water-tube boilers, the coal-handling plant should be modernized, engine-driven generators should be replaced by turbine-driven plants of larger capacity, these alterations and the addition of a new turbo-generator beyond those in substitution of engine sets, costing about $427,000. A new loan could be raised for the new turbine plant but in the engineer's judgment, and also no doubt in that of the local government board, which has the power to approve or disapprove of large new capital expenditure, between $360,000 and $370,000 is rightly a charge against renewals fund. That fund, however, stands at less than $100,000. The importance of the scheme to the future successful working of the undertaking, may be gathered from the estimate that the above outlay of $427,000 would reduce the capital expenditure per kilowatt from $450 to $270. In regard to the Newcastle case, the engineer in his references to the tramways power house, says: "The steam and electric plant has been efficiently maintained and continues in operation free from breakdowns but as the plant gets older, there is a tendency towards obsolescence, and ample provision must be made for this." The engineer speaks in terms of praise of the recently added grease-eliminating plant which renders the boilers much freer than they used to be from injurious deposits, but regrets "that the plant was not installed at an earlier date." A point worthy of mention in respect to this Newcastle system of tramways is the benefit that is derived from batteries which help over the exceptional peak load experienced in large cities and towns, especially those of an industrial character where workmen's traffic on the cars is considerable. At Newcastle from this cause the peak load during the evenings for a period of one hour is double the normal output of the station at any other time of the day. It is pointed out how heavy a plant provision has to be made for dealing with this class of traffic which has to be carried at a fare so much lower than is charged to the ordinary passenger.

ALBERT H. BRIDGE.

London, September 22, 1911.

Important Patent Decision on Gas-Producer Operation.

Judge Brown of the United States Circuit Court of Massachusetts has recently handed down an important decision in favor of the complainant in the case of the Combustion Utilities Corporation vs. Worcester Gas Light Company, fully upholding the validity of the Doherty patents, and finds that all the claims in suit were infringed.

Mr. Doherty's invention entirely does away with the use of water and steam for regulating the temperature of combustion and preventing clinkers, thus obviating all the evils attendant upon their use, and the invention consists of a process of employing an incombustible gas, preferably carbon dioxide, mixed with air and introducing this draft current to the fuel bed of a producer for the purpose of regulating the temperature and has for its object not only the regulation of combustion and prevention of clinkers but also a considerable reduction in the amount of fuel required to obtain a given result.

The Doherty apparatus patent was also held by the court as having been infringed. The patent has to do with the means and methods employed to regulate the mixture of air and diluent gases.

Beauty in Public Utilities.

Mayor Harrison, of Chicago, Ill., has appointed a municipal commission to advise concerning local improvements whose installation can be given beautiful effects, and the commission's attention will be first directed to trolley poles and electric light posts. The commission includes William Carroll, city electrician, and E. B. Ellicott, electrician for the Sanitary District.

BOOK REVIEW.

"Practical Applied Electricity." By David Penn Moreton. Chicago: The Reilly & Britton Company. Flexible leather, 438 pages (4½ by 7 inches) with 326 illustrations. Supplied by the ELECTRICAL REVIEW PUBLISHING COMPANY for $2.

This book is very well adapted for those who desire a good introduction to the most common applications of electrical science. It is based largely on the course of lectures given to evening-class students at Armour Institute of Technology, at which the author is associate professor of electrical engineering. The first part of the book is devoted to an exceptionally clear exposition of the most important fundamental principles of direct-current and electromagnetic theory which is copiously illustrated by diagrams and examples. Considerable space is given to electrical instruments and methods of measurement. Naturally direct-current dynamos and motors are treated at length, not only as regards their principles and construction, but also as to their operation and care. Other types of dynamo-electric machines are described, together with methods of distribution, storage batteries, electric lamps and illumination, and wiring methods and calculations. Since the book is not intended to be a complete compendium of applied electricity, only two chapters are devoted to alternating-current theory and machinery. The final chapters include methods of resuscitation from electric shock and a number of mathematical, wiring and other tables. The printing, binding and illustrations of the book are excellent. Its treatment and arrangement of topics resembles that of a textbook more than that of a popular handbook, such as its form suggests. This is no detriment, however, for through its carefully prepared index it can be made to serve both purposes. By the elimination of all mathematics beyond simple algebra, the book has been made of service to those who have no advanced training beyond good common sense.

No Chicago Electric Show for 1912.

At a recent meeting of the board of directors of the Chicago Electrical Trades Exposition Company it was decided that the customary annual electrical show be postponed until 1913.

A bronze statute has been erected at Poleymeux, in the Rhone Department, France, in memory of Ampère.

Electrical Notes from Continental Europe.

By Our Paris Correspondent.

Two electric plants have been erected within a recent period in the eastern part of France, not far from the Swiss frontier. One of these, the Refrain station, is a hydraulic plant of 50,000 horsepower, while the second plant, at Ronchamp, is a steam plant furnishing 30,000 horsepower. Both these stations work upon extensive power networks and can be interconnected if need be. The Refrain hydraulic plant lies upon the Doubs River and contains five turbine sets of the 3,000-horsepower size at present, furnishing three-phase current at 5,200 volts, which is stepped up to 55,000 volts. A double line runs for twenty-five miles to the Etupes substation, which serves as a regulating point for the power network, and it receives a line coming from the Ronchamp steam plant. From this point two 50,000-volt lines proceed to various substations on the network, and in these the voltage is lowered to 9,000 volts for local distribution.

The second station is located at the Ronchamp Collieries, which lie in the region of Belfort. The product from the extensive coal fields is all taken up by local industries and coke ovens, but as there is a great deal of waste product, it was decided to erect an electric plant here in order to make use of this. At present there are installed three Zoelly steam-turbine sets of 2,500-horsepower size and a fourth group of 5,000 horsepower, all of these being of French make. Shortly there will be added another 5,000-horsepower unit. Steam is furnished by two batteries of ten boilers, half of which are fitted with automatic stokers. The fuel is a mixture of waste products and good coal. The Zoelly turbines are coupled to three-phase, 5,000-volt alternators, a bank of transformers stepping the voltage up to 30,000. One of the power lines runs to Belfort and others cover the neighboring regions. There are seven substations on these power lines, which lower the voltage to 5,000 volts. Structural iron poles are used for the 30,000-volt lines and wood poles for the 5,000-volt wires. Current is used in Belfort and in many smaller places, and also for the large industrial plants in the region.

The use of peat briquets in gas producers is being discussed among engineers in various parts of Europe. Successful results in the way of running moderate-sized electric plants by the use of gas engines working on producer gas were obtained by the Körting firm, gas-engine builders, of Hanover, Germany. A plant of this kind was installed in Sweden for lighting the town of Sredala, using a four-cycle gas engine coupled to a 3,000-volt alternator. It is found that the gas producer works on 2.1 pounds of peat per horsepower-hour. Peat is procured near by and is taken out by an electric excavator. After drying for two weeks in the air it is made up into briquets, and these are broken up into small pieces to be used for firing the gas producer. The present electric plant has two gas-engine groups of 150-horsepower size. More recently the same company erected a larger station at Visby, in the Gotland Island. It contains six gas producers and engines of 250-horsepower size, and in this and the preceding plant the producers can be fed with peat containing as much as thirty or forty per cent of water.

The Austrian Government is engaged upon an extensive project in order to secure hydraulic power from the Danube, and it is proposed to erect two hydraulic plants on different parts of the stream which will produce a total of 100,000 horsepower and over. The Danube will be used between Pressburg and Raab, and the first plant, of about 40,000-horsepower capacity, will serve to produce current for the electric lighting mains of Pressburg, which is one of the large centers of this region, and also for feeding a power-line network for the supply of manufacturing industries. At Zengg, in Croatia, will be erected the second and larger station, reckoned at 60,000 to 80,000 horsepower, and it will be run upon a network for the use of the town of Fiume and the Adriatic Coast region.

Among recent electric station or traction projects in Germany we may mention an electric road of short length which runs up the slope of the Merker at Baden-Baden. Connected to it is a level section of road of short length. Another new electric line is to be constructed by the Siemens-Schuckert firm from Bonn and the suburban town of Godesberg. A twenty-five-mile electric railroad is to run from Breslau to the Zobten mountain region, and it is intended to run express trains upon it. A suburban electric road is to be built from Dusseldorf to the town of Vohwinkel. The railroad, which is now in construction in the region of Cologne, will be equipped for electric traction. This line is known as the Vorgebirgsbahn and it connects with the Cologne-Bonn Railroad. A recent project is an electrically operated cable line running upon the Lilienstein heights, and a current supply will be taken from the Elbthal central station. Among electric plants, we note the new station at Glauchau, Saxony. It is to supply the town mains in connection with the already existing station. At Nuremberg there will be erected an electric plant known as the Mittelfranken station, and it will serve a large power network. The Siemens-Schuckert firm is to carry out the construction. An extensive station is also being erected at Coblentz to supply a number of power lines.

Outside of the wireless coast stations belonging to the Navy Department, the French telegraph service is operating five stations for the use of the public, two of which are on the English Channel and three in the Mediterranean region near Marseilles or Algiers. The station of Porquerolles, which was erected in 1904 by the Navy Department, will soon be replaced by a new and more powerful post at Cros de Cagnes, near Nice. In addition to these, a new plant is being built on the Atlantic Coast at Bouscat, near Bordeaux, and a seventh post on the Channel at Havre is planned for the coming period, and it will no doubt be opened in 1913. Since the international rules were laid down at the Berlin Congress of last year the coast stations have been carrying an increased traffic, and the figures show that from May 15, 1910, to March 1, 1911, there were handled 8,768 wireless messages of a total of 96,763 words. The Ouessant post, on the Channel, and the Saintes Maries post, on the Mediterranean, carried the

greater part of these wireless messages.

One of the newest trackless-trolley lines runs from Alba to Bavolo, in Italy, this line being about ten miles in length, with seven-per-cent gradients. The overhead line consists of two fifty-square-millimeter wires and upon it runs a trolley made up of four rubbing contacts carried on the end of a flexible rod, this latter being mounted upon the car. The present cars are fitted with two direct-current, sixteen-horsepower motors running on 600 volts at 1,200 revolutions per minute. Such cars weigh about four tons empty or six tons when fully loaded with thirty persons. Current comes from a three-phase hydraulic plant, and in the station is installed a special rotary group supplying the trackless-trolley line. A steam plant also serves as a standby.

The Southern Railroad Company is engaged upon plans for an extensive electric railroad system in the Pyrenees region of France. In addition to several lines which are now in operation, there are to be built many sections of line from twenty to sixty miles length which will cover different parts of the mountain region. The total length of roads included in the project is about 300 miles, divided among twelve or more lines. The single-phase system will be used, at fifteen cycles, and the electric plants will supply power lines working at 55,000 volts. Substations are to lower this to 12,000 volts, which is the standard adopted for the trolley wires. The locomotives, however, will carry transformers, so as to reduce this voltage to 285 volts for use on the motors. Two types of locomotive are designed, and one of these is fitted with four single-phase motors of 125-horsepower size.

Water power is abundant in the mountain region, and a number of lakes can be utilized as natural reservoirs, in some cases building dams and other hydraulic work so as to increase the surface and capacity. The electric road which is now running between Villefranche and Bourg Madame uses current from the Cassagne hydraulic plant, which is fed from Bouillouses Lake, and the surface of the reservoir is increased by a dam fifty feet in height. This plant now furnishes 5,000 horsepower. Another station, the Porté plant, uses water from Lanoux Lake, which is the largest in the Pyrenees region. Several new plants of large size are to be built in order to carry out the above project, and one of the largest of these is the Sousoneou station. A dam 100 feet high and 400 feet long, built across the valley, will form an artificial lake which provides a 2,300-foot head of water, and the turbine plant will be laid out for 20,000 horsepower in the first place. Another hydraulic plant at Soulom will make use of two different falls and will produce 25,000 horsepower.

A suspended-cable electric line from Chamonix up the side of Mont Blanc to the Aiguille de Midi peak has been lately installed by a Milan firm, Ceretti & Tanfani, and it is attracting considerable attention, as such suspended systems are few in number. In the present one the carrying cable is suspended from a series of high structural iron towers, and upon it runs a carriage with four rollers. From this is hung the small passenger car and the carriage is drawn along by a separate cable which serves for the traction and runs upon drums at each end of the line. The drum at one end is driven by a 150-horsepower electric motor. In general about fifty horsepower is required to draw the car, with a maximum of ninety horsepower. The linear speed is ten feet per second.

A number of steam railroads in the region of Brescia, Italy, have been connected so as to form a common system and are now changed over to electric traction. These lines run to the localities of Salo, Toscolona and others. Current comes from neighboring hydraulic plants, and two substations are erected for the railroads. One of these is located at Brescia and contains two 250-kilowatt motor-generator sets with synchronous motors running on 3,000 volts and forty-two cycles. The motors drive 1,200-volt railway generators which work in connection with a storage battery. Each substation runs two feeders for the railroad line, and this latter is divided into four sections. The trolley wire is operated at 600 volts and cars carrying two or four motors are used.

Hydraulic power is to be used for the electric supply of Constantinople, according to the present project, in addition to the already existing steam plants. The Sakania River, lying at eighty miles distance, is to be used, and two separate turbine stations will be erected. The upper station can be called upon for 15,000 horsepower for 3,000 hours annual use, with a maximum of 40,000 horsepower, using a 180-foot head of water. About 8,000 horsepower on the average can be secured from the second station, with 120-foot head of water. Should an increase be desired, there is additional power available in the upper part of the stream.

A. De Courcey.

Paris, September 19, 1911.

Electric Power Development from Boston's Water Supply.

The city of Boston and the cluster of Massachusetts cities and towns contiguous to it have earned the distinction of developing hydroelectric power in connection with their water-supply system. The Metropolitan Water and Sewerage Board has established the Wachusett reservoir, with a capacity of over sixty-eight million gallons, by damming the south branch of the Nashua River near Clinton, thirty-five miles west of Boston. The head of the reservoir is 395 feet above Boston; this was regarded as 100 feet more than necessary or desirable. It was, therefore, decided to utilize the excess 100 feet of head for the generation of electricity. Authority was granted the Metropolitan Board to provide for such development, which was done in a preliminary manner when the dam, dikes and aqueduct were built, a few years ago.

The hydroelectric equipment was installed this year. It comprises four horizontal-shaft turbines running at 400 revolutions per minute and each direct-connected to a 1,000-kilovolt-ampere sixty-cycle, three-phase, 13,800-volt generator. There are also two exciters averaging 100 horsepower each. The entire energy is sold to the Connecticut River Transmission Company at 0.53 cent per kilowatt-hour. The equipment of the plant has cost about $125,000. It is expected that about $25,000 will be realized annually from the sale of electrical energy to the Connecticut company, so that the plant will have paid for itself during the five-year term of the present contract with this company.

Over 2,000-Foot Head.

A hydroelectric plant which is to be constructed for the municipality of Penticton, B. C., will operate under a static head of 2,115 feet, the effective head being computed as 2,045 feet.

Central-Station Practice

VEHICLE-BATTERY PRACTICE IN CENTRAL-STATION COMPANIES.[1]

BY S. C. HARRIS.

Central-station companies' methods of operating lead batteries only will be treated of in this paper. Only those features of battery practice will be presented which are of importance in producing the best results in the operation and life of the batteries, and special reference will be made to the need of more uniform practices.

If the highest efficiency of the electric vehicle is to be obtained, a determined effort must be made to secure standard methods both in the construction and operation of vehicle batteries.

When the electric vehicle attains to the fullest measure of usefulness of which it is capable, and when battery exchange stations are located at convenient points for all users of battery power, it will be necessary that the battery compartment of the various designs of the same capacity of vehicle shall be similarly located and of similar shape so that a standard battery may be used. The location of the battery compartment should be such that the least possible time is consumed in changing batteries. At the present time, in central-station garages where several makes of vehicles are used, it is necessary to have spare batteries for each make of the same capacity because the battery compartments are not of similar dimensions, and in some cases the arrangement is such that the load must be removed before the battery can be changed. Differences in design of this nature seem unnecessary and cause confusion and a waste of time in changing batteries. Take, as an example, a wagon that can do, ordinarily, forty-five miles on average roads; after having done twenty-five miles the order comes in for the same wagon to make twenty-five miles more, probably on hilly roads, to deliver some merchandise within a specified time. There is not time to boost sufficiently to insure a return trip to the garage and the battery must be changed. A half hour or more is required with some designs of vehicles to make a change of batteries, which, if more conveniently arranged, could be done in five to ten minutes. All battery compartments should be arranged so that all the cells are easily accessible for inspection, cleaning and watering, otherwise the batteries will not receive as careful attention as they need to prevent the jars from burning and developing leaks, which are liable to make the vehicle inoperative. It has been remarked that some designers have forgotten that there was a battery to go into the vehicle until after it was built and then, of course, it was necessary to find a place for it. As the battery is of as great importance as any other part of the mechanism, it should receive as much consideration by the designer.

The construction of the battery itself needs some standardization. There are different styles of straps, each of which has its sponsors, while in reality any one of those at present in use is satisfactory. The sediment space in the rubber jar varies from one inch to three inches. Some claim that three-inch sediment space would be all right if the wooden separators did not need renewing before the positive plates, but that they find it better to change separators, therefore a one and three-fourth-inch space is sufficient and a saving of space and of cost of jar is made. One glance at the stock of rubber jars that is kept by some central-station garages, where different makes of vehicles are used, will convince anyone of the desirability for standards in rubber jars.

In the construction of the element, the development of the "iron-clad" cell marks a distinct advance toward perfection in the vehicle battery. With improved protection of both the positive and negative plates, lead batteries will require the minimum amount of attention in operation, and indications point to the probability of an increase in capacity equalling in energy output per unit of weight, but requiring less space than the present nickel battery.

There are at present two ways of assembling the cells in the trays; one where all the cells of the battery are put into one tray, and the other where the cells are put into several trays. When the former method is used a hydraulic lift is required to handle the battery and in crowded garages it is very inconvenient at times to have the vehicle run onto the lift when the battery needs attention and should be changed. As a result, the battery does not get as frequent inspections as it should. With this method of construction considerable burning of rubber jars has occurred, because the voltage between adjacent rows of cells is usually high. Unless the tray is very rigid, jar breakage will also result from the twisting of the tray, and the number of jars that must be replaced as compared with the sectional batteries is enough greater to overbalance the advantages, if any, gained in handling the single-tray battery. Not only should the cost of rubber jars be considered in comparing the two kinds of construction, but the more important factor of service while on the road. Every leak in a rubber jar where the circuit is broken means delay and repair work on the street, and is especially objectionable when the load must be removed to get at the battery.

In the operation of vehicle batteries by central-station garages there is a lack of uniformity in methods. It has been said that the central-station companies should be educators in this field, but before this position is taken it should be the endeavor of each company to determine first if the methods practiced in its garage are productive of the best results. The only way to procure the best method is to make comparisons of the practices and results of all the central-station companies. The writer has collected some data from several of the larger companies through a list of questions answered by them. From this data it is evident that most of the companies do not keep sufficient records of details to be ready to give information that may be desired by a prospective customer, and certainly not enough to be of use in making comparisons with the records

[1] A paper read before the second annual convention of the Electric Vehicle Association of America, New York, October 10.

of other companies. Some companies have the wattmeters on the charging board connected between the rheostat and line, while others have the wattmeter between the battery and rheostat, so that in reading the watthours of charging energy some include the rheostat losses and others do not. This, in some cases, would make a difference of as much as twenty per cent in the efficiency of charge.

The following are some replies received from the different companies in answer to the question asking for the method used by them in charging vehicle batteries:

(A) Battery voltage taken by a curve-drawing instrument; battery taken off charge when voltage stops rising during a period of one-half hour.

(B) Charge at normal rate until each cell averages 2.55 volts, then reduce to finish rate and continue until two readings of voltage alike are obtained; readings taken every half hour.

(C) We charge our batteries at a rate of four amperes per positive plate in winter and three and one-half amperes in summer until the voltage is up to its maximum and remains there for half an hour without rising, when it is cut down to the forming rate and left for a few hours in winter and about one hour in summer.

(D) We charge each battery according to the rates of the makers, at the same time using our best judgment. We discontinue the charge when the voltage stops rising.

(E) We charge at the normal rate and put in ten per cent more charge than discharge by wattmeter readings.

(F) We charge by Sangamo meter and automatic circuit-breaker.

The following are the practices of the different companies for overcharging batteries:

(A) We overcharge at the one-quarter rate when gravity is low, and continue until the gravity stops rising.

(B) We overcharge once a week, as a rule, for three hours at the finish rate, observing the gravity of the pilot cell every thirty minutes, and also the gassing.

(C) Once in two weeks the batteries are taken from the vehicles when an overcharge is given, which is discontinued at a given time after the voltage and gravity show no further rise.

(D) Our general rule is to overcharge once a week, but it is a rather difficult matter to set down a rule for overcharging, as the batteries when new will give 2.5 volts per cell at the forming rate at a normal temperature, but when the negative becomes old they cannot be brought back to their original negative voltage on one overcharge no matter how long continued, but require several charges and discharges to accomplish this end.

(E) We give an overcharge of fifteen per cent about every twelfth or fourteenth charge, according to the amount of work the vehicle is doing.

(F) We give a ten-per-cent overcharge once a week, when all cells gas freely.

(G) We give a daily overcharge of fifteen per cent according to the Sangamo meter, and an overcharge once a month to whatever extent is shown by the monthly test of the battery to be necessary.

(H) We give each battery a twenty per cent overcharge on Sundays, that is, twenty per cent more than was discharged on Saturday.

It would be gratifying to know that all of the above practices in charging and overcharging produce good results in the life of both positive and negative plates, but the data received on the life of plates are not sufficient to determine whether one is better than another. What is wanted is data to allow of determining the one best method, and to standardize that method.

The following data have been received on the life of plates:

(A) Our batteries have lasted anywhere from eight months to three years. The mileage life in commercial trucks is from 5,000 to 10,000 miles, and on pleasure vehicles from 8,000 to 12,000 miles.

(B) We have made no renewals yet, but our batteries have already done from 400 to 480 days' actual service, and are approaching the 10,000-mile mark. The batteries are charged alternate nights and sufficiently boosted during the day to get capacity for the day's work.

(C) Days and mileage life of batteries discarded in the five months from January 1 to June 1, 1911:

Type of Vehicle	Positive Plates of Batteries	Positive Plates Average Days	Positive Plates Average Miles	Negative Plates of Batteries	Negative Plates Average Days	Negative Plates Average Miles
Pleasure	3	335	7,310	..	...	.....
1,000 lb.	2	253	7,962	..	...	.....
1,000 lb.	11	349	6,510	3	597	10,427
2,000 lb.	1	349	8,854	..	...	.....
2,000 lb.	4	397	7,716	1	614	11,741
6,000 lb.	1	356	4,151	..	...	.....
6,000 lb.	2	336	4,027	..	...	.....
10,000 lb.	1	337	5,019	..	...	.....
10,000 lb.	2	342	3,670	..	...	.....
(D)						
1,000 lb.	..	232	3,891	..	...	.....
2,000 lb.	..	226	3,640	..	...	.....

The life in days of the various batteries given in the above table does not represent the number of days that the batteries were in commission, but the number of days that the batteries were used in the vehicle. It is the general belief that the miles life a battery will give (other things being equal) depends upon how many miles are done on each charge, therefore it would be unfair to compare the results in miles obtained by the different companies, as the routes laid out for the different kinds of service do not in many cases require the vehicle to do near its full mileage. The best way to compare the results in the life of plates is by records of the number of full charges given the batteries, and until a uniform method for keeping this data by the central-station garages is adopted little can be done towards determining which are the best practices in operating our vehicle batteries.

Opinions are about equally divided as to the advisability of sealing the rubber jars of all the different sizes of batteries. Batteries for pleasure cars without a doubt should have the covers sealed, but for commercial vehicles there is a decided difference of opinion. Some claim that it is not necessary to seal the covers, and that there is an advantage in being able to raise the cover to inspect the gassing of the cells; others claim that sealing and nippling prevent foreign materials from getting into the cells and reduce the amount of escaping gas during charge, thereby increasing the life of both the rubber jars and the trays, because they are free from dampness.

For ascertaining the condition of the battery while in service in the vehicle or when charging, an ampere-hour meter is being extensively used. When the battery delivers its rated capacity and the vehicle develops no extra friction the indications given by this meter are of value in warning the driver when the battery is near the limit of its capacity. This is probably the most valuable feature the meter possesses that is not taken care of by other means. When the battery has not its rated capacity or the vehicle takes more current per mile than ordinarily, then the use of this meter as a guide for the driver may be misleading. This applies principally to vehicles covering routes that require nearly the full capacity of the battery. For this class of service, when the conditions in the vehicle and battery are normal, the use of the ampere-hour meter may be justifiable; but for vehicles that do not have to do near the mileage of which they are capable, and consequently do not discharge the battery near to the limit of its capacity, the ampere-hour meter seems an unnecessary expense, especially where other meters are used to indicate a full charge of the battery. There are many vehicles operating at the present time without ampere-hour meters and the results obtained are satisfactory; in this connection, however, it should be stated that the drivers become so well acquainted with their machines that from the decrease in speed they can judge accurately enough the amount of capacity remaining in the battery.

The ampere-hour meter does not indicate the condition of the battery, but indicates only the amount of charge or discharge, and may mislead the switchboard attendant into believing that his battery is fully charged, when, in reality, considerable more charge is necessary. The efficiency of the battery varies according to the amount of discharge; consequently, when the meter is set to a percentage that will give a full charge under ordinary conditions, this same setting under extraordinary conditions when the battery is completely discharged or probably overdischarged will not give sufficient charge to properly charge the battery. Where a firm has a large number of vehicles and a competent man is employed to care for the batteries this objectionable feature would be overcome, but where one or two machines are operated by the stable man, bad results may be obtained if the meter only be used to indicate a full charge. In such cases it is the practice to disregard the meter for charges following overdischarges, and also for regular overcharges.

The purpose of this paper is to call the attention of those operating electric vehicles to facts which, if properly considered, may lead to greater endeavor to secure uniform practices in the construction and operation of vehicle batteries. A difference of 100 per cent in the miles life of batteries doing practically the same kind of service is surely worth investigating to find the cause. The cause may be improper operation, or it may be poor plate manufacture, but if no combined effort is made to find the fault, the remedy may not be found.

In conclusion, the writer wishes to express his belief that a committee of this Association composed of members from various concerns using electric vehicles, whose duty it would be to investigate battery practice and suggest standards, would accomplish results which would increase the efficiency of the electric vehicle.

Boston Edison Buys Land.

The Edison Electric Illuminating Company of Boston has purchased a tract of about ten acres of land, and proposes to erect buildings costing about $500,000, to take care of the growing needs of the construction and operating departments. It is proposed to erect on the property just acquired a complete service depot, which will include stable, garage, machine shop, store rooms of various kinds and general construction and operating offices for the departments having to do with this class of work.

Part of the new property will be laid out for tennis courts, baseball diamond, etc., for the use of employees. The library which the company maintains at Boylston Street will be removed to the newly acquired land.

Low-Pressure Turbine Test.

Recently an economy-guarantee test was made on the 600-kilowatt Westinghouse low-pressure turbogenerator at the woolen mills of the Peace Dale Manufacturing Company, Peace Dale, R. I. A brief summary of the tests is given in the accompanying table and it should be noted that the tests were made at two loads, as it was inconvenient to make trials at greater loads and these were considered sufficient to show the ability of the turbine to meet the requirements. The turbine fulfilled the guarantee in every respect.

The live-steam line from the boilers has two branches, one leading to an 800-horsepower simple condensing engine and the other running to the low-pressure turbine through a high-pressure throttle valve, while, of course, the exhaust of the engine connects to the low-pressure turbine.

For the purpose of measuring the steam consumption, the method followed was to blank off the connection between the main exhaust pipe and the turbine and supply it with live steam through the high-pressure throttle valve, the speed being controlled by the high-pressure governor. This course was adopted so as to employ a system of orifice measurement for determining the quantity consumed and to furnish steam in a dry state. Orifice measurement provided the simplest and most accurate method that could be applied to the case in hand.

Two orifices were employed, one containing four 1.25-inch holes and the other one 1.25-inch hole. The former was placed in the six-inch pipe supplying both the low-pressure turbine and the circulating condenser turbine, and the latter in the three-inch line supplying the circulating condenser turbine alone. These orifices were calibrated in place by drawing through each of them certain measured quantities of steam and noting the attending pressure drop, thereby obtaining data from which to compute the result sought. The steam used for the calibration was measured by discharging it into the atmosphere through a number of half-inch orifices and observing the pressure above the orifices, this being referred to the calibration of a single one of the same at various pressures obtained by condensing the steam in a tank of water set on platform scales and weighing it. The quantity of steam consumed by the low-pressure turbine was found by subtracting that measured through the one-hole orifice from the total quantity measured through the four-hole orifice.

The tests were made by George H. Barrus, with the assistance of Lockwood, Greene & Company.

TEST OF 600-KILOWATT WESTINGHOUSE LOW-PRESSURE TURBOGENERATOR.

Load in kilowatts	472	302
Percentage of full load	79	50
Throttle pressure, absolute, pounds	13.0	8.7
Inlet pressure, absolute, pounds	12.5	8.4
Throttle temperature of steam	273	269.5
Inlet temperature of steam	263	261
Normal temperature of saturated steam at inlet pressure	204	185
Superheating at inlet	59	76
Vaccum in exhaust pipe by mercury gauge, inches	28.3	28.5
Barometric pressure, inches	29.55	29.53
Revolutions per minute	3,600	3,600
Net steam per hour to turbine, pounds	14,468	11,192
Steam per kilowatt-hour, pounds	30.6	37.0

Utilization of Peat.

In collaboration with Professor Frank, of Charlottenburg, Dr. Caro has discovered a method for the economic utilization of peat which avoids former mistakes. The generators consist of shaft-like ovens, where the burning of the peat is conducted in a way admitting limited quantities of air. Thus, a dry peat in pieces can be treated, and produces a gas strongly impregnated with tar fumes, which gas, after purification from tar, will furnish a useful heating and power gas. The inventor found that if the gasification is properly conducted, peat containing as much as sixty per cent of water could be used.

This process permits the manufacture of a good heating gas during the entire year, and it can be used in connection with the generation of electricity. Another result of the discovery is the extraction of nitrogen by this process, eighty-five per cent of this element contained in the peat being recovered therefrom. This nitrogen can be converted into ammonia by the introduction of steam. The method admits of the production of ammonium sulphate, and thus furnishes agriculture with a valuable fertilizer.

Commercial Practice—Management, Rates, New Business.

INTRODUCING ORNAMENTAL STREET LIGHTING IN PEORIA, ILL.

BY T. P. PINCKARD.

Before telling you how we got it, let us first tell you what we have, and you will then better understand what our problem was and how we solved it.

Our ornamental street-lighting system in Peoria, is installed in the heart of the retail district, on a straight, wide street of fairly even grade, that was formerly very well lighted by series arc lamps, two unbroken lines of flat-rate window lighting and a multitude of flat-rate signs and some outline lighting, all of which remains excepting the arc system. It extends straight away for five solid blocks, without a break, on each side of the street, and consists of sixty-four Flour City Ornamental Iron Works five-light cast-iron posts, bolted to concrete foundations and arranged twelve posts to the block, six posts on each side of the street in each block, all equally spaced seventy-two feet apart. This spacing is very satisfactory, and places the corner posts on the property line and not at the very corner on the curb line of the intersecting streets. Each post is equipped with four sixty-watt and one 100-watt, 105-volt, multiple tungsten wire-type lamps in a vertical upright position, burning every night in the year from dusk to midnight and from dusk to dawn, respectively. The control is effected in each block separately, if necessary, by electrically operated solenoid switches, the circuit for which is manually operated from the station two blocks away. The glassware consists of twelve-inch and sixteen-inch Alba globes, Alba glass adding much to the general appearance of this system, especially in the daytime. The entire three-wire, 105-210-volt cable system on both sides of the street is drawn into fiber conduit laid in concrete under a new curb which was being placed at the time the lighting system was being installed, and at about the center of each block is connected underground to the manhole in that block of our underground general distribution system, for in this district there are no overhead wires and no other poles than the wires and poles of the street railway system.

The complete ornamental lighting system as described above was installed at the expense of the benefiting property owners and ground-floor tenants, at the rate of $2.20 per property front foot, the proportion of this cost that the property owner and his tenant should pay for the frontage involved being left to them to decide, and in some few cases the tenant paid the full amount. Under contract with the city, the Peoria Gas & Electric Company furnishes current for and maintains the entire system at a flat rate of $50 per post per year.

All of the above sounds very simple and easy indeed, and so it is as an engineering proposition, but even regarding that feature, it is well to secure ideas before laying out your plans. However, it is the business-getting side of the question that we wish to rehearse for you, so please permit our recital of an experience earned, but hardly deserved, and do not forget that our systematic minds planned, even as yours will, a straight, broad course to the object of our desires. That we successfully achieved our object is not so much because of our scheme of operation, but more because of persistent effort, inspired by the confidence that we could accomplish anything that had been accomplished anywhere else, and do it even a little bit better.

Peoria, with a population of nearly 70,000, is the second largest city in Illinois, and is a wide-awake and hustling community, but its merchants and property owners were slow to become interested, and were much slower to adopt a universally beneficial public improvement such as the lighting system in question, the cost of which, probably for both installation and maintenance, would have to be provided by them. This condition will be found everywhere and is hard to overcome. It would be very fortunate if the merchants would take the initial step in the matter, thus to some extent quieting the thought sure to arise in the minds of many of them that the whole proposition was a scheme of the electric company and would be a source of great revenue for it. But rather than wait any considerable period for the merchants to take the initiative, it is well to begin some activity that will father the desire and bring the question to their attention. There are, no doubt, many ways of doing this, and our way succeeded in Peoria.

About two years ago we induced one of our prominent merchants to install three five-light posts in front of his building, and it was not long until a competing merchant followed the lead and installed similar posts, and soon other merchants inquired as to the cost of similar equipment. The number of these inquiries convinced us that the iron which we had placed in the fire was at last hot enough to strike, so we attended a meeting of the Association of Retail Merchants with a complete layout and costs of an extensive system of ornamental lighting, suggesting to them the advantage their Association had, as a body organized to further their own interests, in getting behind the proposition to improve the retail district in a way that would reflect great credit upon the Association and at the same time bring more of the general public often into the shopping district, a result that could be accomplished in no other way at such small cost to each merchant. We were never pessimistic, but the outburst of such enthusiasm as was shown at that meeting was hardly expected, and when we came into town the next morning we were almost surprised that the system was not already installed—we were dreaming a year or more into the future, and during that year we learned a lot that we had not before known of human nature and the specie property-owner-with-a-long-lease-tenant. The merchants on the street selected as the future bright way were not slow to become organized into committees to handle the work necessary to accomplish the matter, such as securing a resolution from the City Council providing maintenance, deciding upon the style, number, the location of posts, and securing signatures to frontage contracts. Judging from the time it took to do all of these things, there is not an easy job mentioned in the above list, and the various committeemen soon found themselves reporting nothing but progress and doing little else than reporting, and even the formality of rendering a report was soon neglected.

There was no need for haste on any part of the plans until the frontage had been signed up, and many of the frontage signatures were mighty hard to obtain. It was arranged that the work

of securing frontage signatures should be handled by a committee of three men on each side of the street in each block, and in this way most of the signatures easy to obtain were secured, but the conditions were the same as you have, or will find in your own or any other city—unsettled estates, long leases, with the tenant or the owner unwilling to improve the property beyond absolute necessity, owners living or traveling out of touch with the situation and not within reach of personal argument. All of these conditions delayed matters to such an extent that most of the committeemen lost interest and practically gave up the scheme as impossible, and indeed it seemed almost so to us, but a few enthusiasts, you will find them in every community, never gave up hope, though a year's effort seemed to have produced absolutely nothing.

During all of this time we, for the company, remained very much in the background, but personally kept in touch with the situation and gave encouragement wherever we could. This was the condition of things when one day we were informed that a new pavement and new curbing that had been delayed for some time, was to be placed on the street and that work was to start within two weeks. It was discouraging news, for the conduit must be layed ahead of the new pavement or the entire lighting scheme would be blocked for years, and we realized that in less than two weeks we must accomplish more than had been done within the previous fifty weeks. At this juncture we got in the game openly and rounded up the few real live ones among the former committeemen, and with them made personal appeal to the anti-improvement property holders and merchants. The same energy, if so applied, would have sold all the land in the Sahara Desert, but the net result was that we had over ninety per cent of the total frontage signed, sealed and delivered in time for us to have the material and labor on hand and put in the conduit as the pavement was going in. But we were not yet assured that the system would be installed complete in every block, as the ten per cent not signed was made up of frontages here and there all down the street, and these signatures were the hardest to obtain. We were at the point where we had to get them, and every now and then our efforts were rewarded, until by the time the posts arrived the only unsigned space was in one side of each of two blocks. We were determined not to set posts in any block not fully signed up and soon had the posts erected in all of the other sections. The direct result of this was that the attention and efforts of the signers in the anti-blocks was directed to the non-signers, and the necessary signatures were soon received, and when current was first supplied it was turned into a system that was as complete as that system is today.

Without any previous announcement, or any formality whatsoever, the first illumination was provided on a Saturday night, and before nine o'clock that evening the entire populace seemed to know of it, for the street was crowded and the city seemed wider awake than ever before. The comment was not only favorable but flattering, and the general opinion of the townspeople and frequent visitors is that no other one thing has added so much to the city's appearance. One thing we are sure of, and that is that the proposition has justified itself to the merchants who made it possible, as their street is really crowded every evening, whereas other business streets are comparatively deserted. In self-defense the merchants on two other streets have, in a very short time and in a similar way, financed similar lighting propositions which will soon be installed, and merchants on other streets have all but completed their arrangements for the same sort of a system.

We now have installed, and being installed, a total of 239 ornamental lighting posts, which includes 74 one-light posts just completed and ready for current on a residence street. In addition to the above propositions are now being considered for a total of 102 five-light posts.

If the merchants in your city are backward in taking up the ornamental lighting proposition, send them over here to talk with the Peoria merchants.

Power Rates for Pumping.

The Southern California Edison Company has submitted a new schedule of rates to the city of Long Beach, Cal., for power to be used in pumping at the municipal pumping stations. These rates are as follows: From midnight to 6:00 a. m., one cent per kilowatt-hour; from 6:00 a. m. to 5:00 p. m., 1.33 cents per kilowatt-hour, this rate also being in force from 9:00 p. m. to midnight; from 5:00 p. m. to 9:00 p. m., two cents per kilowatt-hour.

Additional Co-Operative Electrical Advertising Page in Cleveland.

For two years past the Cleveland Electric Illuminating Company and other electrical interests in Cleveland, including the jobbers and dealers in electrical supplies, the contractors and the manufacturers, have joined their forces in a "People's Electrical Page" in the newspapers. Starting out first with a single newspaper, the Cleveland *News*, this method of advertising proved so successful that last year the Cleveland *Plain Dealer* also took it up and this year the third paper, the Cleveland *Leader*, will also carry a "People's Page." Credit for this successful record is due in large measure to M. E. Turner of the Illuminating Company, who first launched the project in Cleveland, and has piloted it skilfully during the past two years. It has been the custom to suspend this method of advertising during the summer months, and starting it afresh each fall. The first appearance of the page this fall will be in the issues of Saturday, October 14, and the page will be published thereafter every Saturday until early next summer. Succinctly stated the "People's Electrical Page" consists of a few gleanings of electrical news put up in popular form and bordered by a thick fringe of advertisements placed by the participating electrical firms. It is proving itself to be a most effective method of reaching the public.

A Porch-Light Campaign.

The Southern California Edison Company, Los Angeles, Cal., is carrying on a unique campaign in its efforts to increase power consumption. Eight-candlepower porch lights are advertised as providing protection from burglars, night prowlers, porch-climbers, etc. In its advertisements for this business the company reproduces photographs of installations and states that at the present rates charged by the company it is possible to burn an eight-candlepower lamp ten hours a night for a month for sixty cents. The advertisements bear the heading, "A Night Watchman for Sixty Cents a Month." The company states that these advertisements are producing profitable business.

Electric Lighting and Illuminating Engineering

PROCESSES FOR MODIFYING THE COLOR OF MERCURY-VAPOR LAMPS.

MAKING THE GREENISH LIGHT NEARER TO SUNLIGHT.

The first researches of the character of the rays of the mercury arc in the visible spectrum, show these to be four in number; two yellow, one green, and one a very intense violet. A most most marked characteristic is the total absence of red radiations. Researches in this line were first made by Hartley and Ramage and later by Gouy.

Mitscherlich mentions the existence of rays 547 and 435 $\mu\mu$ as a result of the introduction of cyanide of mercury in the flame of a blowpipe; but in searching for the same rays by the employment of acetate, cyanide, and nitrate of mercury, C. de Watteville has not been able to observe them. Nitrate of mercury brings out, according to this investigator, the ray 2536.72 to the exclusion of all others.

A number of careful researches along these and other lines have proven that mercury arcs in a vacuum contain several rays which may be easily absorbed by a number of common materials.

As a result of the lack of red rays in the spectrum in the mercury arc there is a great change of appearance in this light, making it impossible to compare colors by it. For this reason red appears brown or dark lilac; white and black are not affected. It may be stated as a general rule that the colors which are altered the least are those which are of one of the tints contained in the mercury arc spectrum; that is those of yellow, green, blue or violet. For this reason green and blue are made even more intense by mercury-vapor light and vegetation appears greener and more beautiful. It even appears to possess a kind of fluoresence.

From an optical standpoint this green light has many advantages. It is known that the ocular discomforts of the luminous arcs are a result of the red and orange rays emitted. Numerous demonstrations show that the mercury-vapor lamp which has none of these rays, does not fatigue the eyes and that it has a good influence physiologically and psychologically; its flame is absolutely stable and has none of the fatiguing fluctuations of ordinary arc lamps. It is superior even to the Welsbach gas lamp whose greenish tint is not so much due to the absence of red rays as to the predominance of green rays.

Although the mercury lamps are rich in ultra-violet rays they have a negliable effect on organisms as compared with X-rays. On the other hand experiments on eye fatigue prove that there is no possibility of these rays escaping from the lamp, the glass used being opaque to ultra-violet rays. The pressure in the mercury-vapor tube is, moreover, much higher than that in an X-ray tube.

The color of the mercury-vapor arc, which is very soft and non-irritating, has a beneficial effect on persons who work under the lamp. Workmen not only easily habituate themselves to the new conditions and the odd color of the accustomed objects, but they appear to turn out better work. This fact has been noted in many shops. Moreover, it is known that the eye fatigue and congestion of the eyes resulting from red light irritate and excite the nervous system. On the contrary the green or bluish light rests and relieves muscular fatigue and also has the valuable property of making the form and contour of the objects illuminated as clear as in sunlight.

Also as a feature peculiar to the mercury-vapor lamp, it might be mentioned that it has a penetrating power which is an advantage though it brings in a slight inconvenience. It is first of all advantageous from the standpoint of luminous efficiency. Blue rays have the property of showing less decrease in intensity in a given distance than red or orange rays. At a great distance a greenish light would appear brighter than a red or orange light of the same intensity. This law depends on the fact that the atmosphere is less absorbent for green or blue light than for other colors.

The inconvenience mentioned is one of measurement, and brings up a question as to whether the mercury-vapor lamp can be correctly measured with a photometer using a reddish-yellow lamp. The comparison will be more and more favorable to the mercury arc as the distance between the lights increases.

Such a state of affairs is unfortunately true, and measurements accord exactly with theory. Two monochromatic lights, green and red, cannot be balanced photometrically and a measurement leads only to an indeterminate result. The optic nerve, which is after all the primordial organ of measurement, is more impressed by white light than by any of the colors composing the spectrum, and it responds in different degrees to different colors. Red and green appear differently in any case and results often are of little value to the real intensity of illumination.

USE OF FLUORESCENT SCREENS.

Many processes have been devised for the modification of the peculiar color of the mercury-vapor lamp, so that the rays could resemble in a greater degree those of daylight. All provide for the production of red rays with the minimum loss of luminous intensity of the arc. As they differ in the manner of application, separate study is necessary.

To color the light of the mercury-vapor lamp the most simple process is evidently that of surrounding the lamp with a red glass, or with a special glass composed of elements rich in red or yellow rays at the working temperature of the lamp. It is proposed to put into the glass some substance, such as potassium or sodium, in the form of halogen salts, to which would be added substances not dissociated at the temperature of the arc, such as calcium fluoride. Alkaline silicates could also be added to the glass.

Cloths tinted with fluorescent colors give good results as to coloration but the luminous efficiency of the lamp suffers. About twenty-five or thirty per cent is lost by resorting to this means.

1 Translated and abstracted from an article by Jean Escard, in *La Lumiere Electrique*, August 26, 1911.

If it is desired to suffer this loss, a number of substances may be chosen which will transform the green rays of the arc to red rays. Thus a great number of analine colors (eosine, rhodamine) appear red in the light of the mercury-vapor lamp. This property of transformation may be utilized by surrounding the lamp with a piece of silk, tinted with one of the coloring materials. One inconvenience of this method is that the aniline colors fade rather quickly under the influence of the rays of the lamp.

COMBINATION OF THE INCANDESCENT LAMP WITH THE MERCURY-VAPOR LAMP.

Numerous experiments have shown that the association of rays of two different kinds, with a view of obtaining a white light, is very satisfactory as to luminous efficiency and also as to quality of light. It is known, of course, that each color of the spectrum produces a certain degree of visual effect, and that the combination of colors making white light is the most marked.

According to M. Bastian it will not appear at all as a combined light but

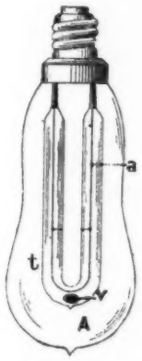


FIG. 1.

as a different light, and the lighting will be much improved by the combination of the two lights, red and blue. This can be demonstrated by projecting two pencils of light, one red and the other green, on a white screen. The lights are first projected separately and then the two superposed on the screen. In this way a white light is obtained, and it is claimed that the lighting produced by the superposed rays is greater than that from both the isolated rays.

This shows why the combination of the green spectrum of the arc with the red spectrum of the incandescent lamp gives such excellent results. An additional steadiness of light is also obtained, for the mercury-vapor lamp, it is known, burns more steadily if it has a certain resistance connected in series. The incandescent lamp furnishes this series resistance. By varying this resistance it is possible to modify the proportions of red and green rays within certain limits so as to give superiority to one or other of the two colors.

In the Fish method the rays of the mercury-vapor lamp are projected onto

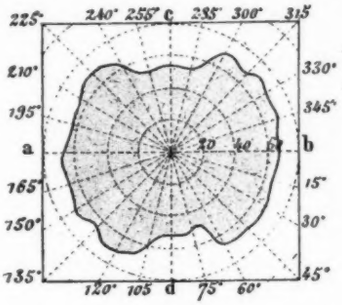


FIG. 2.

a glass reflector, and after being reflected mix with the rays from an ordinary incandescent lamp rich in red and yellow rays.

THE HOPFELT LAMP.

A combination of the carbon-filament incandescent lamp with the mercury-vapor lamp is possible in a very simple unit. The carbon filament may be put inside the mercury tube, making not only a simple unit but one satisfactory in appearance.

The Hopfelt lamp, shown in Fig. I, has a filament *a* set in the U-shaped tube *t* which contains a drop of mercury and an inert gas. The tube *t* is inclosed in a globe *A* to lessen the cooling. By maintenance of a vacuum in the outer globe the efficiency of the lamp is increased about twelve per cent. The inert gas in the inner tube has a pressure of about 1.5 millimeters and that of the mercury varies between fifty and seventy-five millimeters. Because of the high temperature of the filament and the high conductivity of the inert gas the heat radiated causes volitilization of the mercury. The temperature in the tube is uniform, a condition essential to the good operation of the lamp. If conditions were not thus, the vapor produced by the direct radiation of the filament would condense in the colder regions and the vapor tension would remain low.

The best position of the lamp is that indicated by Fig. 1, which brings about the highest efficiency and the easiest starting. The maximum light is obtained almost immediately after starting, although the time depends on the distance between the filament and the drop of mercury.

This lamp gives a very satisfactory color. Analyzed by the spectroscope the characteristic rays of mercury cannot be seen except just at the moment of starting. These rays vanish at the end of a few minutes, giving place to the combined radiation.

A specific consumption of 1.65 watts per candlepower is shown, and the photometric curve obtained is sensibly a circle. Fig. 2, which was obtained with a 20-volt lamp using 0.47 ampere, shows this. The horizontal axis *ab* corresponds to the section perpendicular to the plane of the two arms of the filament and *cd* to the plane of the filament. As may be seen, the maximum luminous intensity is sixty-eight candlepower in the plane *ab* and the average intensity is sixty-two candlepower. The life of this lamp varies between 400 and 1,000 hours, depending on whether the lighting is continuous or intermittent, each lighting period in the latter case being followed by a rest of several hours.

In the type shown in Fig. 3 the ex-

FIG. 3.

terior globe, which always causes heating, is done away with. The gas chosen is nitrogen, whose spectrum contains abundant red rays. A pressure corresponding to one millimeter of mercury is used in the tube. The advantage of the mixture of nitrogen and mercury vapor here is to permit the filament to work under better conditions of efficiency than in the ordinary tube, and to avoid blackening the tube.

The consumption of this type of lamp is about two watts per candlepower; its life varies between 500 and 800 hours.

USE OF A METALLIC FILAMENT.

In order to obtain different light from that of a carbon incandescent lamp, metallic filaments coated with various substances are used. Oxides of such metals as barjum, calcium and zirconium produce the tints desired. An

alloy of several refractory metals, such as platinum, tantalum, tungsten, etc., may be used as the filament.

Fig. 4 shows the arrangement of most of the commercial mercury-vapor lamps of this type. The positive electrode *A* is of iron or tungsten; the negative electrode *B*, being made of platinum, is in the form of a spiral with one extremity in the mercury. The other end, insulated by means of a small glass tube, is connected to the positive side of the line.

When the current is thrown onto the lamp by closing the switch *i*, the spiral *B* is raised to a red heat. The mercury then partially vaporizes and the arc is started to the auxiliary electrode *a*. Then the switch i^1 is opened and the arc plays between *A* and *B*. Normal operation is secured without flickering, and the color of the light is excellent.

HAHN AND BASTIAN LAMPS.

In the Hahn lamps the ordinary incandescent lamps are used as an auxiliary. The iron electrodes of the mercury-vapor lamp are replaced by carbon electrodes. Energy ordinarily dissipated in the regulating resistance is in this lamp transformed into light, and there is at once a decreased current consumption and an increased production of red rays. In the best combination of the two kinds of rays the incandescent lamp is placed below the mercury-vapor tube, a reflector surmounting the combination.

The diffused light obtained in this manner does not fatigue the eyes, as it is extremely soft and uniform. It is even possible to look directly at it for some time without discomfort, which is certainly not possible with the great majority of lighting systems of this sort. A mercury tube 95 centimeters in length and 20 millimeters in diameter requires 75 volts pressure and 3.2 amperes, giving an average intensity of 380 candlepower.

In the Bastian lamp, as well as in the Hahn lamp just described, the incandescent lamp is depended upon for a source of red rays. In this fact lies the source of the greatest inconvenience in this system of lighting, for the variations of current particularly the rush caused in starting the lamp cause the filament to deteriorate rapidly.

If the question of economy is a secondary one, the incandescent lamps may be placed on a circuit independent of that of the mercury-vapor lamp. Tests made in this connection have, however, established the fact that employees very often do not turn on the red-ray auxiliary. In spite of the peculiar color of the mercury-vapor lamp it is accepted alone on account of its soft light.

USE OF CARBON ELECTRODES.

A combination of the ordinary carbon-electrode arc lamp with a mercury-vapor lamp is very easily made, and gives excellent results both as to color and efficiency.

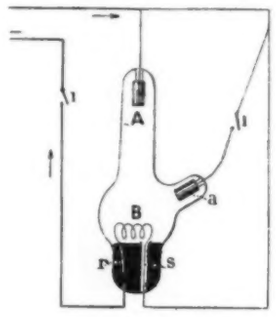


FIG. 4.

In the Vogel lamp a globe supported from beneath is traversed by a tube through which the fixed lower electrode passes.

A small quantity of mercury surrounds this electrode so that the end of the carbon is a little below its surface, perhaps as much as five millimeters. The upper carbon is moved as consumed, by a special regulating mechanism and is surrounded by a sheet-iron chimney. The lamp is started with about 10 amperes at 50 volts, which changes as the mercury vaporizes, to 9 amperes at 56 volts. The arc twists slowly about the upper carbon, and if the vaporization of mercury is violent the whole tube appears to be illuminated.

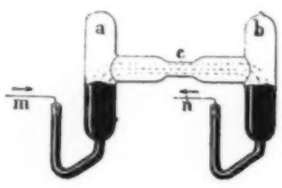


FIG. 5.

A 2,200-candlepower lamp made in this manner operates at a consumption of about 0.27 watt per candlepower. In a twelve-ampere lamp with electrodes fifteen-millimeters in diameter the consumption of the positive electrode is 0.25 millimeter per hour, and of the negative electrode 0.1 millimeter. The expense for mercury is insignificant, since the sheet-iron chimney is built in such a manner as to condense the mercury which is used again and again.

Careful experiments show that it is very easy in this way to obtain arcs 150 millimeters in length and 75 millimeters in diameter. The color of the light may be changed by the use of various impregnating salts. Experiments that have been made with salts spread on the surface of the mercury were not satisfactory, as the high temperature caused them to evaporate and disappear rapidly.

SUBSTITUTION OF MERCURY AMALGAM.

Amalgams of the alkaline metals, sodium and potassium, are used in certain mercury lamps employed in connection with laboratory work or spectroscopic research. In the Weintraub lamp the amalgam forms the cathode, the anode being made of graphite. Starting is effected either by means of an auxiliary arc, or with a spark produced at the surface of the amalgam by bringing two pieces of metal in contact.

With this lamp a reddish-yellow light is obtained, though the color depends naturally upon the density of the current and the proportion of alkaline metal in the amalgam. It is necessary that about forty per cent of sodium or potassium be present in order to have the mercury spectrum disappear almost completely and bring about the yellow or red color of light.

The feature limiting the use of these lamps is the effect which the sodium and potassium have, at high temperatures, on the glass tube. Basic silicates are formed which blacken the tube and greatly lower the efficiency of the lamp.

CADMIUM AMALGAM.

Cadmium lamps invented several years ago by Gumlich have only recently been perfected by M. Heraeus, who utilizes a quartz tube, and secures a very intense, well-colored light. The lamp shown in Fig. 5 has two vertical tubes *a* and *b* connected near the middle by a third tube *c*. Tubes of smaller diameter, coming from the bottom of *a* and *b*, are bent twice at right angles, receiving the iron electrodes *m* and *n*, which are sealed in with gum or other substance.

The amalgam used contains 14 parts of cadmium to 100 of mercury, is soft at ordinary temperatures and becomes as liquid as mercury on being slightly

heated. In order to start this type of lamp the cadmium amalgam must be heated until it gives off considerable vapor, at which time an arc is struck with the aid of an induction coil. The lamp operates on between one and two amperes.

AMALGAMS OF ZINC AND SODIUM.

Red rays in connection with the mercury-vapor lamps may be secured by the addition of zinc to the mercury. If a zinc-amalgam electrode (100 parts of zinc to 30 of mercury) be placed in a quartz tube, the arc obtained will give the rays of zinc in addition to those of mercury, one in particular, ray 636.4 $\mu\mu$ being very intense. The light obtained resembles sunlight in a marked degree, and bright red appears in its true color instead of showing dark brown as with the mercury-vapor lamp. Yellowish objects, however, either appear too green or too red.

COMPLEX AMALGAMS.

The addition of sodium to the cadmium obviates the difficulty last mentioned, and gives a light similar to that of the Bremer lamp. A little bismuth may also be added to the sodium and cadmium with the effect of softening the substance and preventing a possible tube breakage.

Amalgam lamps used in laboratory work contain a liquid amalgam which has the following composition:

Mercury	60 per cent.
Lead	19 per cent.
Bismuth	20 per cent.
Zinc	0.5 per cent.
Cadmium	0.5 per cent.

Very often traces of thallium or antimony are added. The lamps are started in the same manner as the cadmium amalgam lamps and with the maximum voltage at the terminals give a spectum very rich in rays of all the metals, and especially rich in ultra-violet rays.

A great number of gases, such as nitrogen, argon, helium and neon, may be employed as a means of supplying the desired red rays.

Street-Car Lamp Tests in Chicago.

As noted in these columns, the Chicago Railways Company, somewhat over a year ago, equipped all of its street cars with tantalum-filament lamps and subsequently instigated an investigation of their life and service. The engineering department has now completed and made public, the results of this investigation covering a period of twelve months.

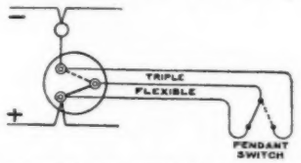
In general these results are that the renewals on thirty-two-candlepower lamps are 72 per cent per year and the renewals on sixteen-candlepower-tantalum lamps are 100 per cent per year. These average results are based on 10,350 car months and 27,708 lamp renewals during the period from May 23, 1910, to May 31, 1911.

Some tests have also been made with Mazda lamps. These tests were made during the summer months and do not therefore, cover the period of heavy burning. During 394 car days with twenty-seven Mazda lamps in a car only twenty lamps had to be renewed. These lamps are twenty-candlepower, twenty-five-watt rating and most of the time were installed on six cars. The results so far indicate that renewals with Mazda lamps will be twenty per car per year with twenty-seven lamps installed on a car.

Making Electric Lights More Convenient.

An interesting communication on making electric lights more convenient is furnished by a correspondent to *Electrical Engineering*, of London.

In effecting the *maximum* reduction in the initial cost of electric light installations, the *minimum* amount of control is usually left to the user. Thus in bedrooms, staircases, passages, etc., lack of convenience is most often found and such becomes painfully apparent to any unsatisfied consumer as he becomes better acquainted with his installation, and meets friends who have been lucky enough to have had theirs better carried out.



INSERTION OF TWO-WAY SWITCH.

What can be more exasperating, for example, than to find in a bedroom that control of light is obtainable at the door only, this necessitating getting into bed in the dark, and having to get out of bed before light can be obtained again.

It is not an uncommon occurrence to find houses where the only switch control of the hall and staircase light is provided at the front door, the lack of control from the upper floor necessitating the use of the time-honored candle to go upstairs to bed by, or when descending again during the night. These are but two cases, and many others might be cited.

Had greater conveniences been provided, we think that the unsatisfied consumer would have been a satisfied one instead, and proud of the convenience of his installation, which he would point out to his friends on all occasions, and thus indirectly prove a good canvasser for electricity as a lighting medium.

As it is, however, when noticing these weak ponts in his installation, he interviews a contractor with regard to having an improvement made, but is usually informed that the alteration will mean pulling his walls about and upsetting the decorations, etc. Consequently the desired addition is seldom effected, or else postponed for attention when the next decoration upheaval takes place, he meanwhile having to make shift with the installation as it stands.

It is a simple matter to convert the present single-way switch control to that giving control from two points, without any disturbance of the wiring. The conversion simply involves the substitution of a two-way switch for the single-way one.

A hole is bored in the block and a triple flexible cord led off from the switch on porcelain buttons, or through insulated screw-eyes, to the desired extension point consisting of a two-way pendant switch for bedroom use or one of surface or wall pattern for ordinary use.

The simplicity of the adaptation is clearly shown in the diagram herewith, where it will be noticed that the leads are not interfered with in any way when making the change, and that, contrary to usual custom, the common terminals of the two two-way switches are interconnected.

To leave the switch point as it was originally is a simple matter, the two-way switch being made to act as a single-way one by short-circuiting two of the terminals, the flexible and extension switch being disconnected. This provides for the case of the obstinate landlord who requires the installation left as it is found.

This simple method, if commonly known, would assist in providing the contractor with some genuine friends amongst his clients, whose recommendations, following their own satisfaction on the improved conditions, would extend business in the neighborhood.

Telephony · Telegraphy and Wireless

New Naval Wireless Station at Washington.

The United States Navy Department has purchased the apparatus for the new wireless station at Washington from the National Electrical Signal Company, and the work upon this piece of engineering is progressing rapidly.

Contracts for the three towers, one of which is to be 600 feet high and the other two 450 feet each, have been awarded to the Baltimore Bridge Company, which has already laid the concrete foundations. These towers are to cost $105,000, and the buildings, which will cost $68,000, are to consist of a receiving station with a sound-proof room, a transmitting station in a separate room, laboratories, machine and carpenter shops, engine room, pumping station and quarters for men and officers.

The new station will be completed in April of next year, and the Navy Department will detail to it a full complement of expert wireless men.

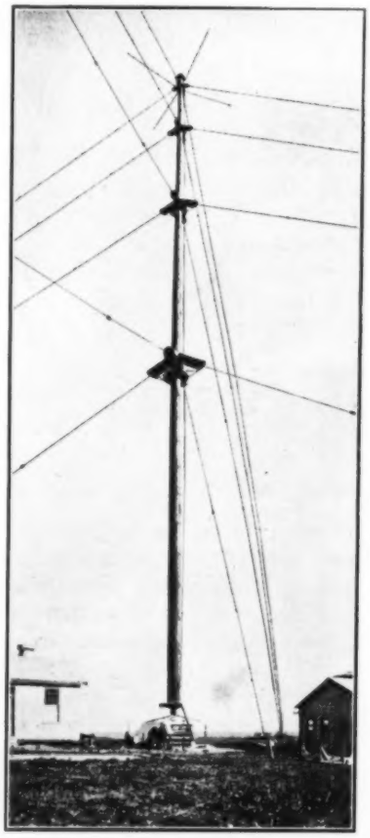
It is expected that classes of instruction will constantly be maintained at the new station. These classes will be taught the phenomena of high frequency, the installation of new stations, and will make experiments with all of the apparatus designed in the Navy wireless telegraph and telephone laboratory.

The wireless telegraph work at the Bureau of Standards, at the navy yard and at other points around Washington will be discontinued as soon as the new station is in working order, although the wireless telephone invented by George O. Squier, assistant chief signal officer, now installed at the Bureau of Standards, will be continued at that place.

The new Navy wireless telegraph station, which is located near Fort Myer, Va., was designed and will be carried out as the result of and in accordance with the tests made between the scout cruisers *Birmingham* and *Salem* and the large Fessenden station at Brant Rock, Mass., which was leased by the government for this purpose.

These tests were for the determination of the range of communication between the two cruisers and the Brant Rock station. Certain quantitative measurements were taken and the course of so-called atmospheric absorption was studied up to a distance of about 1,000 miles.

L. W. Austin, of the Naval wireless telegraph laboratory, has prepared a report for the Navy Department in which the results at Brant Rock are given as follows:



WIRELESS STATION AT BRANT ROCK.

Over salt water the electrical waves decrease in intensity in proportion to the distance (as found by Duddell and Taylor). In addition they are subject to an absorption which varies with the wave-length and which may be expressed mathematically by the term e^{-ad}.

The complete expression for the received current is then

$$I_r = \frac{K}{d} e^{-ad}$$

This is true in general for day transmission. The absorption at night is entirely irregular, varying from zero to the day value, but is on an average much less during the winter than in summer. Variations also appeared to occur during the daytime, but these are probably in general small. The great variations in night absorption make useless all attempts to judge the quality of wireless apparatus from night observations. For this purpose only observations on the average day range have any value.

The received antenna currents for two stations with salt water between are proportional to the product of the heights of the sending and receiving antennas and inversely proportional to the wave-length, provided the antenna resistances remain constant. The experiments indicated that for the greatest efficiency of a flat-top antenna, the vertical lead wires should be bunched so as to reduce their capacity as much as possible and concentrate the capacity at the greatest height. These experiments were carried on with flat-top antenna heights of from 30 to 80 feet and wave-lengths from approximately 1,500 to 4,000 meters.

Taking account of the influence of antenna height and wave-length, the equation

$$I_r = \frac{K}{d} e^{-ad}$$

may be extended and a general day-transmission formula written as follows:

$$I_r = 4.25 \frac{I_s h_1 h_2}{l\, d} e^{-\frac{0.0015\, d}{\sqrt{l}}}$$

This is where the currents are given in amperes and all lengths in kilometers. From this it would appear that it is advisable to rate stations according to the magnitude of the antenna current, or perhaps better according to the product of the current and the height. This formula has been tested for sending currents from 7 to 30 amperes, antenna heights 37 to 130 feet, wave-lengths from 300 to 3,750 meters and distances up to 1,000 nautical miles.

In regard to the value of the day ab-

sorption it is only possible to say that the above expression is satisfied within the limits of error of the observations. It is quite possible that when observations are made at distances of 2,000 to 3,000 miles, the value of the absorption coefficient will have to be corrected by 10 or even 20 per cent, as this amount of error could exist without discovery at the distances covered in these experiments. It is also possible that the square-root law relating to the absorption with the wave-length is only an approximation.

Condenser Losses at High Frequencies.

The following experiments have been carried out by L. W. Austin for the purpose of determining the equivalent resistance of various types of condensers in high-frequency circuits. The method used was to observe the current in a spark circuit containing the condensers under test and then substitute a Fessenden compressed-air condenser of approximately the same capacity and add a high-frequency resistance sufficient to reduce the current to the same value as that observed with the other condensers. It was found possible to make these resistance observations with an accuracy of about 0.05 ohm. Special experiments showed that the resistance of the compressed-air condenser under the given conditions was 0.25 ohm, which was probably due to imperfect insulation and eddy currents in the metal case.

Two types of copper-coated Leyden jars were furnished by the Wireless Specialty Apparatus Company, and one type each by the Telefunken Company of America and the United Wireless Company. The Moscicki condensers were of their well-known form, incased in brass tubes, with the glass thickened at the elges of the conducting coating and with these edges covered with an insulating liquid. The paper condenser was of a well-known make.

The results of the tests with the condensers in air are given as follows:

Volts equal 14,500 (Max.) Current equals 7 to 8 amperes. Wave-length equals 1,000 millimeters.

	No. of Jars.	Capacity Microfarad.	Added Resistance Ohm.
Wireless Specialty (1)..	3	0.00603	0.80
Wireless Specialty (2)	3	0.00605	0.90
Telefunken	3	0.00612	1.30
United Wireless	2	0.00603	1.55
Moscicki	1	0.00548	0.575
Paper		0.00275	2.05
Compressed Air		0.00575	

Special experiments showed that the slight differences in capacity between the compressed air and the other condensers made no observable difference in the results, the inductance remaining the same. The paper condenser, on account of its small capacity, was measured in parallel with a glass condenser of known loss and its resistance deduced from these observations.

Comparisons were also made by the same method between the compressed-air condenser and the different sets of Leyden jars, the latter being immersed in a heavy transformer oil, the conditions of the experiment being the same as before. Here no difference exceeding 0.05 ohm was observed between the jars and the compressed-air, indicating that the losses in the glass of the jars is small compared with the brushing losses.

Experiments were next tried with three Wireless Specialty jars immersed in oil at voltages from 4,700 to 18,500 (maximum). The circuit containing the jars was the same as above, except that there was no spark gap, it being excited by a quenched-gap circuit to which it was coupled. The decrement was determined by means of a wave meter in the usual way. There was no certain increase observable with increasing voltage.

Comparisons were next made between three jars in oil and three in air using the added-resistance method in a circuit excited by a quenched-gap circuit. The results were found to vary according to the cleanliness and nature of the glass in the jars exposed to the air; the difference in resistance in air and in oil being nearly negligible at 4,000 volts, and amounting in the Wireless Specialty jars to about 1.4 ohms at 20,000 volts. The increase was approximately proportional to the square of the voltage, in agreement with the results of Fleming.

From this follows a conclusion which is contrary to the ordinarily accepted view; that is, that the brushing losses are not reduced by placing jars in series if the capacity and voltage remain the same, for if one jar be replaced by four jars in parallel-series, the voltage on each jar is reduced to one-half and the loss per jar to one-fourth. The brushing surface is increased four times, therefore the total loss remains the same. This conclusion was proved by experiment to be correct.

Another experimental fact which is not so easily explained is that the losses in jars with only their edges immersed in oil are considerably greater than when the whole conducting surface is covered. This result is opposed to the idea that the air losses lie wholly at the edges of the conducting coatings. This fact has been verified a number of times.

A New Wireless Telephone System.

An American consular officer furnishes some memoranda of a series of experiments that have been conducted for some time past near Chepstow, England, for the transmission of the human voice over long distances with the aid of a new wireless system. The inventor, Grindell Matthews, it is stated, submitted his discovery recently to a severe test in the presence of a number of experts. He was placed in the strong room of a big London commercial house and locked in, with nine inches of armor steel, nine inches of fire-brick, and six feet of concrete between him and the outer world. By means of his small portable apparatus he carried on a conversation with an operator in another room on the farther side of the building.

The inventor contemplates a further test through five miles of solid rock between Chepstow and Tintern. He is engaged in long-distance tests in connection with the War Office, and on September 9, spoke from Beachley, in Gloucestershire ,to a point over five and one-half miles away near the Severn Tunnel outlet on the opposite side of the river. He intends to carry on experiments between Chepstow and Cardiff, about twenty-five miles.

The inventor has named his instrument the aerophone. A complete set of instruments for a five-mile radius would cost about $48.

Atlantic Coast Line Adopts Telephone.

The Atlantic Coast Line Railway Company has decided to equip ninety stations with telephone train-dispatching outfits, which will equip in this manner about 235 miles of track, establishing a circuit between Savannah, Ga., and Jacksonville, Fla., with branch lines from Jessup to Waycross and from Waycross to Folkestone, with Savannah, Ga., as headquarters.

Saskatoon Telephones.

The telephone system in Saskatoon, Canada, is being taken over by the Saskatchewan Government, and will be converted to an automatic system.

Industrial Power

ELECTRIC POWER IN A BAKERY.

INSTALLATION AT THE DENZER BAKING COMPANY, MUSKOGEE, OKLA.

A very notable installation of electric motor drive for bakery machinery has been made in the plant of the Denzer Baking Company, in Muskogee, Okla. This plant has a capacity of 40,000 loaves of bread per twenty-four hours in addition to several hundred pounds of pies and cakes. In one corner of the large baking room there is an oven of the revolving type which contains twelve shelves mounted on a rotating device so as to operate after the manner of a ferris wheel, the material on a shelf being subjected to maximum heat when it is at the bottom of the wheel. The door of the oven is on the side facing the position where a shelf is half way to the top of the wheel.

No effort has been spared by the owner of this bakery to make it up-to-date in every respect. The large baking room and the machinery, painted white, together with a clean, white concrete floor, provide a very sanitary arrangement and present a very pleasing appearance. Cleanliness and sanitation are emphasized, as the dough is never handled by human hands from the time the flour is mixed until the loaf is ready for delivery.

The flour is unsacked into a bin in the cellar and elevated by a Hunter flour lifter and conveyor into the large hopper which is suspended above the dough mixer, the hopper being suspended from a lever connected with the scale beam so that it can be weighed at any time. The hopper has a capacity of about seven barrels of flour. The dough mixer is provided with steam and water connections, the latter being equipped with suitable meters so that an exact amount of material may be put into the mixer, day in and day out, in accordance with any specified formula, thus ensuring a uniformity of product. As the bakery turns out several kinds of bread, several kinds of dough are mixed by this device.

The No. 3 Day three-barrel dough mixer, the Day dough breaker, and the No. 4 Hunter flour lifter and conveyor, shown in Fig. 1, are grouped on one five-horsepower motor, running at 1,200 revolutions per minute.

The dough breaker is belt driven from the countershaft that drives the flour lifter. It was first installed on the opposite side of the dough mixer and driven from the sprocket wheel on the end of the countershaft driving the dough mixer. This arrangement did not prove satisfactory and so the dough breaker was moved to the position shown in Fig. 1.

In Fig. 2 is shown the No. 5 Dutchess Tool Company's dough divider which is driven by a two-horsepower, 1,200-revolution-per-minute motor. The dough is transferred to this machine from the rising tubs and, with each revolution of the wheel, four loaves of any desired weight are punched out and dropped upon the delivery belt. The weight of the loaves may be regulated at will by a single adjustment of the machine. This machine has an ingenious arrangement of small hoppers which sift flour on the dough at the proper intervals to avoid any tendency of the dough to stick. The belt upon which the loaves drop consumes one minute in making one-half a revolution, i. e., one minute after a loaf drops upon the belt it is delivered to the molding machine at the other end of the table, thus allowing the loaves to recover from their compression.

The Thomson loaf molder in this plant is driven by a two-horsepower, 1,800-revolution-per-minute motor, the latter also being geared so as to drive the delivery belt. Several loaves are shown in Fig. 3 just about to drop off the end of the delivery belt into the molding machine. This machine kneads the loaves exactly as the old fashioned baker did, turning them in twice from the end, then twice from the side, and finally rolling them around the big wheel at the bottom where they come

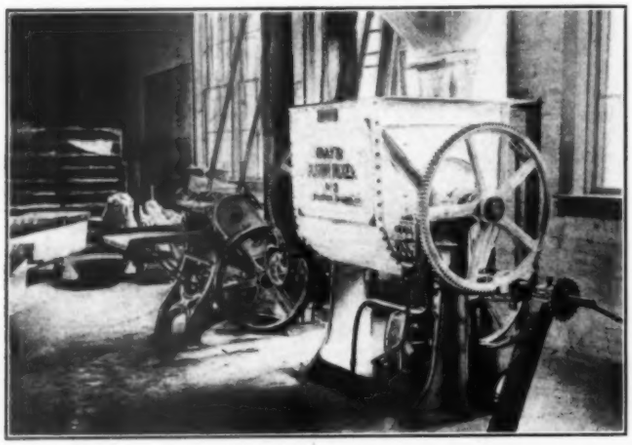


FIG. 1.—MOTOR-DRIVEN DOUGH MIXER.

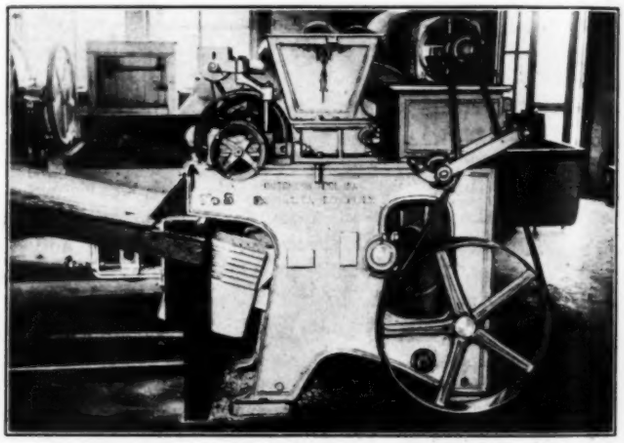


FIG. 2.—MOTOR-DRIVEN DOUGH DIVIDER.

up at the point indicated by the arrow in Fig. 3, and roll into the pan on the shelf, from whence they are carried to the oven. This machine is also equipped with a flour sifter to keep the dough from sticking.

In Fig. 4 there are shown the top of the oven and the two-horsepower, 1,200-revolution-per-minute motor, suspended from the ceiling, which drives the revolving shelves through a countershaft belted to the large gear wheel on the side of the oven in order to reduce the speed. The capacity of the oven is 700 loaves and it is so arranged that the rotating shelves may be stopped at any desired moment so as to bring any particular shelf exactly level with the door for convenience in emptying or refilling.

The Day No. 3 Clipper egg beater, in the plant, is driven by a one-horsepower, 1,200-revolution-per-minute motor through gearing provided with sprocket cones to admit of three different speeds. This egg beater is provided with a steam jacket.

To the right of the egg beater is a hand-operated roll divider, which will strike out thirty-six equal pieces of dough from one large piece, leaving the whole in the shape of the round pan in which they are baked. Hand operation of this machine is necessary due to the fact that it is used but very little.

Two different views of the whole bakery are shown in Figs. 5 and 6, in the latter of which the oven appears.

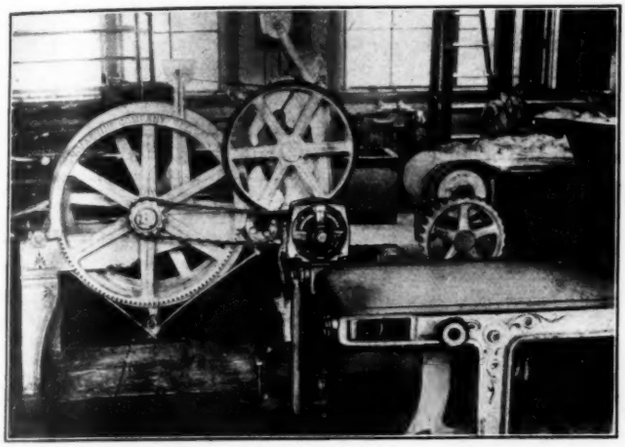


FIG. 3.—INDUCTION MOTOR DRIVING LOAF MOLDER.

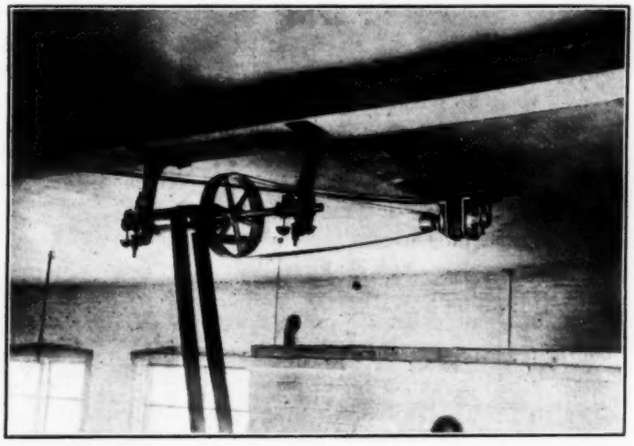


FIG. 4.—MOTOR DRIVING REVOLVING OVEN.

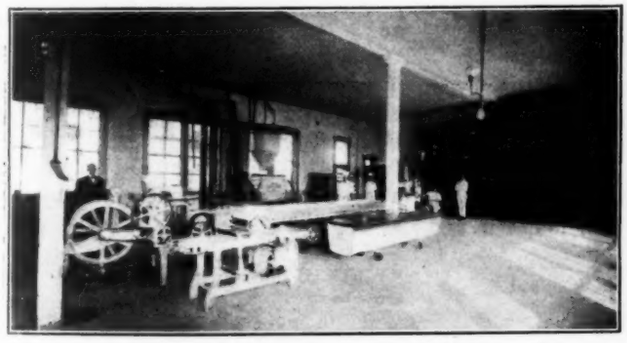


FIG. 5.—GENERAL VIEW OF BAKERY.

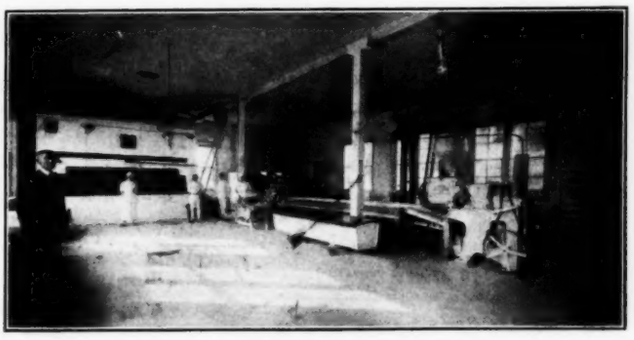


FIG. 6.—ANOTHER GENERAL VIEW.

Three-phase electric power at a frequency of sixty cycles and a potential of 220 volts, for operation of the motors is supplied from the power circuits of the Muskogee Gas & Electric Company. The installation, when running at its full rated capacity, will use 800 to 1,000 kilowatts per month. The electric motors were furnished by the General Electric Company, Schenectady, N. Y.

1650 Volts for Railway.

It is reported that an electric railway in Hungary will operate on direct current at 1650 volts. An overhead wire will be used. There will be four motors on each car, two in series. A motor-generator set will furnish low voltage for lighting, etc.

Electrical Equipment of a Newspaper Plant.

The New York *Globe* has recenty installed an interesting electric equipment in its new plant at Washington and Dey Streets, New York, which is one of the most complete and modern installations of its kind.

On the first floor are three high-speed sextuple presses capable of turning out 36,000 twenty-four-page papers per hour, and two standard speed sextuples which turn out 24,000 papers of the same size. These presses are all driven by Sprague electric motors and operated by the Kohler full automatic system of printing-press control. The motors for the high-speed presses are sixty horsepower and have an operating range between 18,000 and 36,000 papers per hour, entirely by field control, that is, without any unnecessary loss or waste of current. For threading in the web the cylinders are turned over at ten revolutions per minute by a ten-horsepower motor, which is connected to the drive shaft of the large motor through double-reduction spur gearing. The two standard speed

presses are driven by a combination of fifty-horsepower and ten-horsepower motors.

Each press is provided with seven push-button control stations, from any one of which the press may be started, run at low speed and slowed down again or stopped quickly and so easily that no damage to the paper can result.

An entirely independent system of controller circuits with a throw-over switch at the panel and an auxiliary control station is provided with each press, so that no possible delay can follow any trouble to the main control circuits.

An automatic stop is provided to shut down the press instantly in case the paper should break, thereby not only saving paper but avoiding all delay due to clogging up of the cylinders.

In the composing room on the second floor is a battery of twenty linotypes individually driven by Sprague motors. The matrices are moulded in a Wesel matrix roller and dried in Wesel electrically heated matrix tables, which effect a great saving in the time required for drying over the ordinary steam-drying tables. A chute carries the matrices to the stereotyping room on the press floor where the stereotype plates are cast in curved form in a "Junior Autoplate" machine. They are then shaved and trimmed in one operation in an autoshaver, after which they are ready to be placed upon the cylinders. The whole process of making the plate is designed to secure the best possible results in the minimum possible time. The Autoplate machine and autoshaver are driven by individual Sprague electric motors, as are also the flat shaver, curved shaver, and tail cutter, which are kept in readiness for emergencies.

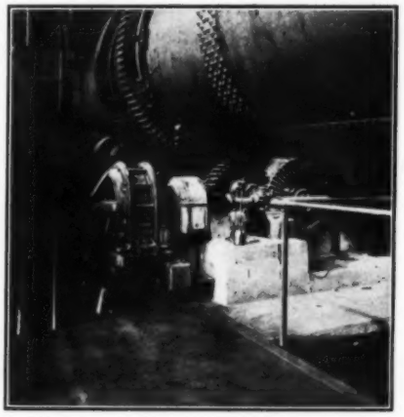
New Process for Fixation of Nitrogen.

A company has recently been formed at Stockholm, Sweden, for the exploitation of a new electrical process for extracting atmospheric nitrogen. The promoters of the company are some of the most prominent men in financial and commercial circles, and the capital is $800,000. The new process has been invented by the engineers T. Thorsell, C. Bjorne and B. Lundin. During the first year the company intends to have the process thoroughly tested by means of experiments, which are going to be carried out on such a large scale as to form a basis for the continuation on commercial lines.

Electric Power in Making Cement.

Without doubt the making of cement today owes much to electric drive as in this industry, where the raw materials are extremely cheap and the labor charges comparatively slight, the importance of keeping the power required as low as possible and of getting the maximum output from a plant, once the investment is made, is absolutely necessary.

It is known that electric drive has high efficiency, ease of manipulation, reliability and low maintenance costs, and the extent to which it is used in various industries depends on the importance attached to a consideration of these factors. The advantage derived from increased efficiency is directly proportional to the ratio of the cost of power consumed in the manufacturing process to the total cost of the finished product.



INDUCTION MOTOR DRIVING ROTARY KILN.

The accompanying illustration shows an eighteen-horsepower motor driving a rotary kiln eight feet in diameter and 100 feet long at the mill of the Sandusky Portland Cement Company.

It may be stated that in the dry process of making cement the raw materials must be crushed, and after being mixed in the proper proportions, thoroughly dried and pulverized. If the wet process is used, the ingredients are mixed, usually in revolving pans, and further reduced in pulverizing mills.

In the rotary kilns, the raw material is next burned, these long steel tubes being lined with highly refractory clay or fire brick. They are sometimes constructed as large as 180 feet in length, with an internal diameter of 10 or 12 feet.

As the material passes through the kiln, it is subjected to a hot blast of gas, oil or more usually pulverized coal, the temperature of the gases varying from 1,000 degrees Fahrenheit at the upper end where the raw material enters, to nearly 3,000 degrees Fahrenheit at the lower end. The effect of this high temperature is to first expel all moisture from the material, and then to reduce the carbonates to oxides by driving off the carbon dioxide, just as is done in the manufacture of ordinary lime. In the hottest parts of the kiln, chemical reactions take place which result in the formation of silicate and aluminates of calcium, the essential constitutes of cement. The product emerges from the kiln as cement clinker, which must be cooled before being handled. This is usually accomplished either in rotary coolers or in cooling towers, after which the clinker is ready for the last steps in the process—the final grinding and pulverizing and in every department electric power is utilized

Production of Electric Steel.

Figures recently published on the production of steel by electric furnaces show that each of the countries turning out considerable amounts have greatly increased their output during the past year. The accompanying table shows how great this increase has been:

	1909.	1910.
Germany	17,773 tons	36,188 tons
Austria-Hungary	9,048 tons	20,028 tons
United States	22,947 tons	55,355 tons

There have also been greater amounts produced in France, Italy, Russia and Sweden than in the previous year, though in these countries the classification of steel manufactured by different processes is not so clearly defined. A corresponding increase will also be shown in English statistics for 1911 when they are published.

Trolley Line Proposed for Peking, China.

The Chinese Board of Communications, which is one of the most efficient of the boards in the capital of the Chinese Empire, has authorized an inquiry into an electric street-railway scheme for Peking. There is scarcely a great capital in the world that has not its street-car service of one kind or another, and if Peking is to be supplied with such a service it will be only bringing itself into line with the other great cities of the world.

An electric rack railway has just been opened in Lago Maggiore, Italy. It rises from Stresa to the summit of Mottzrone at an altitude of 5,000 feet.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

CONSOLIDATED GAS OF BALTIMORE.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, issue a report for the year ended June 30, 1911. The income account compares as follows:

	1911.	1910.
Gross income	$4,867,776	$4,699,098
Expenses and taxes	2,455,440	2,265,534
Net	2,412,336	2,433,564
Fixed charges	1,377,403	1,374,362
Surplus	1,034,932	1,059,202
Preferred dividends	423,603	423,603
Balance	611,329	635,599
Common dividends	283,001	126,001
Surplus	328,327	509,598
Reserve for renewals	219,049	275,596
Surplus	109,278	252,002

AMERICAN RAILWAYS COMPANY.

The American Railways Company has issued its pamphlet report for the year ended June 30, 1911. The income account compares as follows:

	1911.	1910.
Income from subsidiary companies	$ 805,963	$ 623,164
Miscellaneous income	4,451	70,514
Total income	810,414	693,678
General expenses	3,891	4,407
Int. funded debt	370,400	325,209
Taxes and miscellaneous	13,635	10,768
Total deduction	387,926	340,385
Net income	422,487	353,293
Dividends paid	381,787	342,073
Surplus	40,700	11,221
Previous surplus	515,924	504,703
Total surplus	556,624	515,924
Adj. debit	2,437	.....
Profit and loss surplus	554,187	515,924

PHILADELPHIA RAPID TRANSIT.

The Philadelphia Rapid Transit Company reports for month of August passenger earnings, $1,712,222; receipts from other sources, $82,767; total gross, $1,794,898; net, $668,722; fixed charges, $736,683; deficit, $67,910. For the two months ended August 31, 1911, passenger earnings were $3,488,243; receipts from other sources, $163,562; total gross, $3,651,805; net, $1,380,821; charges, $1,473,972; deficit, $93,151.

Following the annual meeting of stockholders, the board of directors met for the purpose of organizing and old officers were re-elected.

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company, for the month of August and eleven months ended August 31, 1911, compares as follows:

	1911.	1910.
August gross	$ 443,108	$ 398,828
Expenses	232,529	216,314
August net	210,578	182,514
Charges and taxes	73,633	65,743
August surplus	136,945	116,771
Eleven months' gross	4,319,819	3,889,475
Expenses	2,478,425	2,237,830
Eleven months' net	1,841,094	1,651,645
Charges and taxes	549,606	485,290
Eleven months' surplus	1,291,488	1,166,355

AMERICAN TELEPHONE & TELEGRAPH COMPANY.

The American Telephone & Telegraph Company has filed with the Massachusetts Highway Commission a report for the twelve months ended June 30, 1911. The company's fiscal year ends December 31. It shows the following:

	1911.	1910.
Gross	$17,344,680	$16,503,890
Other expenses	8,004,562	8,446,731
Net	9,340,118	8,057,159
Other income	24,127,177	24,017,390
Total net	33,467,295	32,074,549
Charges	6,386,314	5,789,109
Surplus	27,080,981	26,285,440
Dividends	21,194,025	19,757,337
Surplus	5,886,956	6,528,103

NASHVILLE RAILWAY & LIGHT.

The report of the Nashville Railway & Light Company for the month of August and eight months ended August 31 compares as follows:

	1911.	1910.
August gross	$ 154,254	$ 146,038
Expenses and taxes	93,471	87,748
August net	60,783	58,290
Charges, depreciation and preferred dividends	48,969	48,175
August surplus	11,814	10,115
Eight months' gross	1,261,044	1,178,540
Expenses and taxes	751,476	688,471
Eight months' net	509,567	490,068
Charges, depreciation and preferred dividends	390,097	387,494
Eight months' surplus	119,470	102,574

NEW ENGLAND TELEPHONE.

The New England Telephone & Telegraph Company reports to the Massachusetts Highway Commission, for the year ended June 30, 1911, compared as follows:

	1911.	1910.
Gross earnings	$13,085,221	$12,225,332
Total net	3,827,420	3,642,967
Surplus after charges	2,888,105	3,522,436
Dividends	2,448,631	2,298,477
Surplus	439,474	1,223,959

On June 30, 1909, subscribers numbered 244,635; in 1911, 300,719. Stations increased from 252,231 in 1909 to 309,168 this year.

British Traction Profits.

A report made of the electric traction companies operating in Great Britain shows that the average dividend of the corporation owned and the municipally operated lines is less than half of one per cent. The 140 lines owned by stock companies are capitalized at $775,000,000, and the capital of the municipal systems is $245,000,000.

Dayton Power & Light Company.

The organization of the Dayton Power & Light Company, a consolidation of several companies in Dayton, O., was recently consummated. The newly elected officials are:

President and general manager, F. M. Tait.

Vice-president, E. P. Matthews.

Secretary, L. K. Funkhouser.

Superintendent, O. H. Hutchings.

Sales Manager, B. H. Gardner.

AMONG THE CONTRACTORS AND SUPPLY MEN

THE PEAKE ELECTRIC COMPANY, Pensacola, Fla., will furnish fixtures for the new County-jail Building at Pensacola. The amount of the bid was $2,388.

GEORGE MILLER, Pana, Ill., received the contract for the installation of wiring and fixtures in the new public library at Pana.

THE KLING ELECTRIC COMPANY, Peru, Ind., has commenced an electrical supply and contracting business in Peru. The incorporators are Alpha H. Kling, Alpheus H. Kling and E. P. Kling.

THE GRANER-MAHONEY CONTRACTING COMPANY, 709 Pine Street, St. Louis, Mo., was awarded the contract for the electric underground extension for the Western Union Telegraph Company, at Kansas City, Mo.

THE J. C. SCHAFF ELECTRIC COMPANY, Chambersburg, Pa., is doing the work of wiring the new post-office building at Chambersburg. This contract includes the furnishing and installation of all the conduits, wiring and switchboards for the complete electric lighting, telephone and vault protection systems.

BLAISDELL & EDWARDS, Long Branch, N. J., have been awarded the contract to furnish the switch-boards and underground cables for the power plant in the new High School Building now under construction in that city. Other contracts received by the company are for wiring of the Avenel Hotel at Pleasure Bay Park and putting in light and power cables at Little Silver.

THE McFELL ELECTRIC COMPANY, which has offices in Chicago and San Francisco, was awarded the contract for installing a lighting system at Fort Miley, Cal. While the contract price of $17,200 was $700 more than that of the lowest bidder, the time of carrying out the work was enough shorter to warrant placing the bid with the McFell Company. The firm has taken a number of large contracts in San Francisco, among whih are the Y. M. C. A. Building, the Bohemian Club, the Royal Insurance Building and the Merchants' Exchange.

New Electrical and Mechanical Apparatus and Appliances

New Line of Direct-Current Motors.

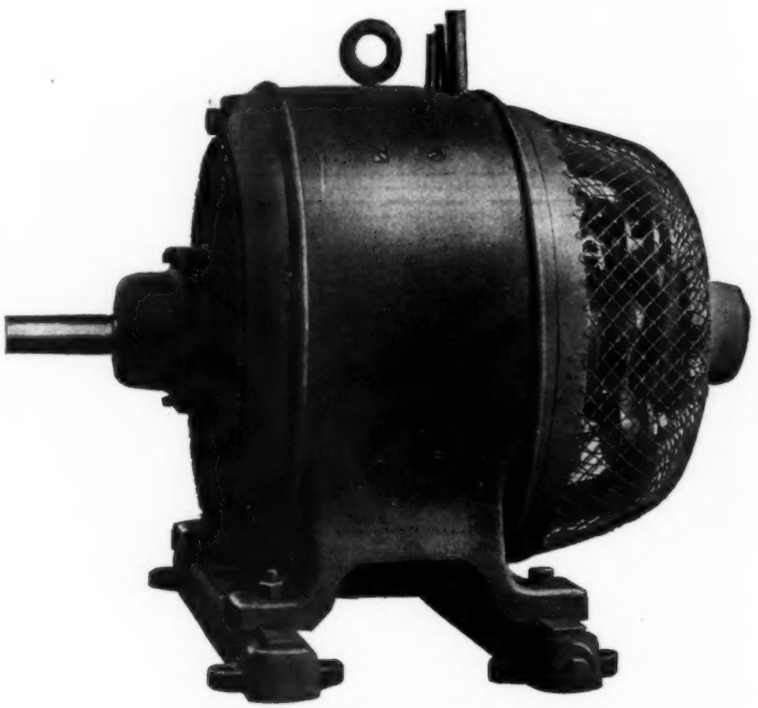
The growing demand for direct-current electric motors that could be applied to the individual drive of machinery of various kinds led to a number of important changes in both the mechanical and electrical design of the motors used. To meet the requirements of this service the construction should not only be compact but also permit of mounting the motor in any position, while the windings and commutator must be either partially or wholly protected from external injury. Geared and direct-coupled methods of driving are rapidly displacing belts and this, together with the fact that sudden and excessive overloads are of common occurrence, requires larger bearings and shafts of greater stiffness than were formerly used on motors of the same class. The demand for a wide variation in speed by shunt field control, with occasional heavy overloads at any speed, has also called for material improvement in commutating qualities.

The Allis-Chalmers Type "K" direct-current motors have been especially designed to meet these mechanical and electrical requirements. They are equally well adapted to belt drive at constant speed and continuous service, or geared drive, variable or adjustable speed, and intermittent service.

The external appearance of these motors is similar to other direct-current motors heretofore manufactured by this company, but the construction differs in many important details, and, in fact, represents a new design throughout.

The cylindrical field-magnet yoke is of open-hearth steel and is machined on each end to receive the housings that carry the bearings. The housings are held in place by through bolts and, on four pole machines, can be rotated 90 or 180 degrees to allow side wall or ceiling mounting; bi-polar machines can be arranged for floor or ceiling mounting. The yoke is machined on the inside cylindrical surface and the poles are fastened to it by cap screws. The pole cores are of open-hearth steel and are circular in cross section. These cores are machined on one end to fit the inner surface of the cylindrical yoke.

The armature cores are built up of sheet-steel punchings insulated from each other to reduce the core loss and consequent heating. The laminations are separated at intervals so as to form radial ventilating ducts. The punchings are firmly clamped between cast-iron end heads which also serve as supports for the ends of the armature coils.



SEMI-INCLOSED DIRECT-CURRENT MOTOR.

In punching the armature laminations, openings are made in the disks so that, when the latter are assembled, ventilating passages are formed parallel to the shaft and connecting with the radial ducts. There is thus a free passage for circulation of air through the core, and all parts of the core and windings are thoroughly ventilated.

The armature coils are form wound and interchangeable; they are heavily insulated with stay binding and the whole armature is thoroughly impregnated with insulating varnish after it has been completely wound.

The commutator is of large diameter and ample wearing depth, having bars of hard-drawn copper insulated from each other and from the shell by the best quality of mica; the mica between the bars is selected so as to give even wear. The clamping rings hold the bars very firmly, and the whole construction is such as to secure a perfect cylindrical surface, free from high or low bars. The commutator sleeve, in all except the smaller sizes, is cored to permit the passage of air through to the armature. The shaft is made of high carbon steel which is very stiff and can stand heavy overloads without vibration or bending.

The bearings are amply large and lubricated by oil rings which rest on the shaft and dip into oil wells beneath. The shaft projection for the pulley is turned smaller than the journals so that the bearing sleeve can be readily removed.

The brushholders are of the reaction type, of the same general design used on all Allis-Chalmers standard direct-current machines. They are simple in construction, positive in action, and allow the brush to follow the surface of

the commutator freely. The brushes are held firmly to the holders but can be readily removed for inspection. The brush studs are fastened to a rocker arm mounted on the bearing housing; this allows the brushes to set at the best running position but, after being once properly set, they require no adjustment under any change in load within the range of the motor. The brushes are connected to the holders by flexible-copper shunts so that current is not compelled to pass through any sliding contacts. Ample carrying capacity is provided in the brushes and brushholders and all parts operate at low temperature.

The standard Type "K" motor is open at the ends to permit a free circulation of air through the machine; it can, however, be made semi-inclosed or totally inclosed by the addition of suitable metal inclosing covers which are readily fitted to the end housings.

These motors are manufactured by the Allis-Chalmers Company, Milwaukee, Wis., in thirteen different sizes.

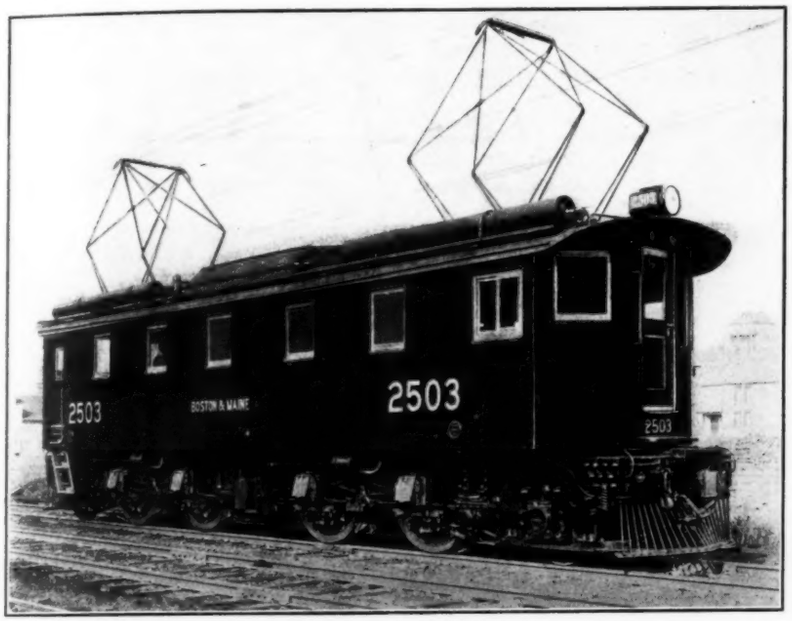


FIG. 1.—COMBINATION PASSENGER AND FREIGHT LOCOMOTIVE.

FIG. 2.—RUNNING GEAR OF HOOSAC TUNNEL LOCOMOTIVE.

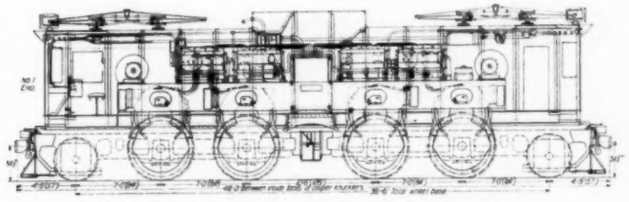


FIG. 3.—TRANSVERSE SECTION OF HOOSAC TUNNEL LOCOMOTIVE.

The Boston & Maine Electric Locomotives.

The Boston & Maine Railroad Company has had in service since the latter part of May, five Westinghouse electric locomotives for freight and passenger service at the newly electrified Hoosac tunnel. One of these locomotives hauls each train and its steam locomotive with banked fire through the tunnel. This practically eliminates the obnoxious steam, smoke and gases incident to steam operation. These locomotives have four geared motors, twelve wheels and are designed for operation on 11,000 volts alternating current. Two are used for heavy freight service and the remaining three for combination passenger and light freight service, one of the latter being shown in Fig. 1.

The electrified zone extends from Hoosac Tunnel Station, Mass., to North Adams, Mass., a distance of 7.92 miles, of which 4.75 miles are within the tunnel. The central zone of the tunnel has an almost level track 1,200 feet in length, with an ascending 0.5 per cent grade up to this level track from both the east and west portals.

The passenger locomotives were designed to handle trains having a maximum weight of 730 tons, inclusive of steam and electric locomotives, and to maintain a schedule time of fourteen minutes between East Portal, Mass., and North Adams, Mass. The locomotives for freight service were built to handle heavy freight trains having a maximum weight of 2,000 tons including both steam and electric locomotives, and are equipped to accelerate this tonnage on the 0.5 per cent grade in the tunnel.

The under running gear consists of two massive trucks shown in Fig. 2. They are known as 2-4-0 articulated trucks and have sixty-three-inch wheels. Each truck has two driving axles constituting a rigid wheel base of seven feet and a pilot axle arranged to swing radially on the well known Rushton truck principle. The truck sideframes follow the general design of the cast-steel frames for steam locomotives, except that they are outside of the wheels. These frames are joined at each end by a cast-steel box-section girder of sufficient strength to care for the stresses involved in bumping in freight service. The bumper girder at each end of the locomotive is equipped with an M. C. B. coupler mounted with a Westinghouse friction draft gear.

The adjacent bumper girders at the midlength of the locomotive are joined by a draw bar with a pin connection at each end. The eye in this bar is elongated at one end and the length of the bar is so arranged that it is impossible for the bar to be subjected to compression under severe bumping conditions. The three wheels on each side of each truck are equalized together. The longitudinal stability of the trucks is provided by the method of mounting the cab. The cab is supported by eight spring-loaded friction plates, two plates resting on each end of each truck. This

relieves the truck center pins of all the weight. This method of supporting the cab interposes two sets of springs in series between the rail and the cab and gives an exceptionally easy riding cab. To relieve the cab from possible pulling and bumping strains, the center pin of one truck is arranged with longitudinal clearance. This truck can not only rotate but can also move longitudinally relative to the cab.

In the interior of the cab a long raised deck is built along the center line which covers the motors and serves as a stand upon which the control apparatus is erected. The central arrangement of the equipment, with the numerous side windows, affords excellent light and ample room for inspection and overhauling.

Each motor is bolted rigidly to cast-steel cross ties, and the weight of the motor is thus carried on the main semi-elliptic springs. The detail of this mounting is such that the motor can be lifted from the truck frame by a crane, after the cab has been removed, or the motor can be dropped into an overhauling pit when the trucks are in position under the cab. This method of mounting gives the highest center of gravity possible with a motor connected to the axle by single reduction gearing. It is particularly advantageous for locomotives that operate over tracks which are occasionally submerged.

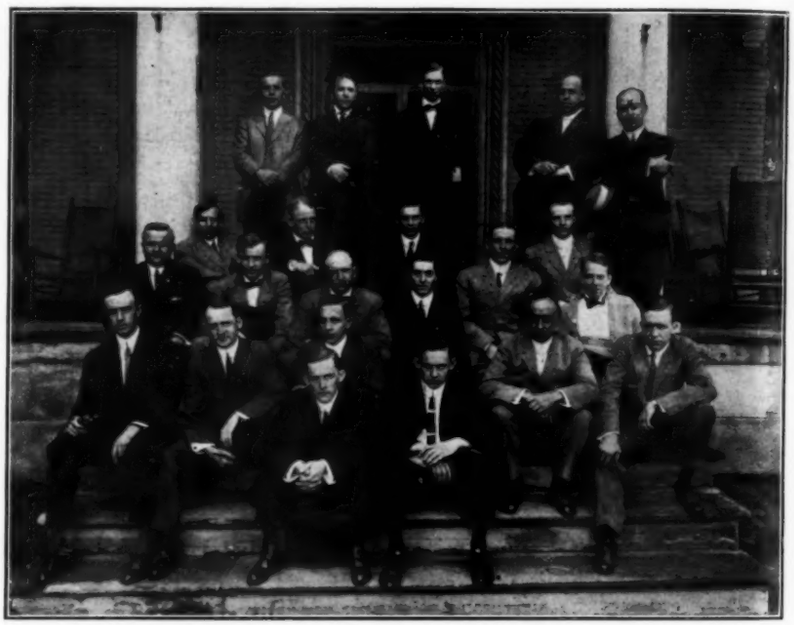
Each end of the motor-armature shaft is fitted with a solid pinion which meshes with a gear having a rim that is flexibly connected to the center. The gear centers are mounted on opposite ends of a hollow axle or quill which surrounds the wheel axle with a 1.5-inch radial clearance between the inner and outer axles. The gear center is equipped with six arms arranged alternately with the wheel spokes. The end of each arm is bolted to one end of a helical spring and the other end is bolted to the wheel spoke. This spring is of sufficient flexibility to allow each wheel complete individual freedom in negotiating track inequalities.

The total weight of each locomotive is 260,000 pounds, of which about 48,600 pounds is supported by each driving axle and about 34,000 pounds on each idle axle. The gear ratio for the three freight locomotives is 22:91 and for the two combination freight and passenger locomotives is 34:79.

Each locomotive is equipped with four Westinghouse 315-horsepower air-cooled No. 403-A motors and with Westinghouse non-automatic unit-switch control. The freight locomotives have a continuous tractive effort of 21,000 pounds in twenty-one miles per hour, and the passenger locomotives have a continuous tractive effort of 12,000 pounds at 37.5 miles per hour.

Conference of Sunbeam Representatives.

The annual conference of representatives of the Sunbeam Incandescent Lamp Company, who act as lamp specialists for the Western Electric Company, sole distributor of Sunbeam lamps in the United States, was held in Cleveland, O., during the week of September 18. The purpose of the conference is to bring the men into touch with each other and with the organization which they represent, as well as to impart technical and commercial information on lamps and illumination, which will be of use to them in their relations with customers. Among those present were men from Dallas, Atlanta, New York City and San Francisco. The program for the conference was arranged and conducted by F. E. Watts, manager of the New York office, and the meetings were held in the auditorium of the Engineering Building of the National Electric Lamp Association.



GROUP AT CONFERENCE OF SUNBEAM REPRESENTATIVES.

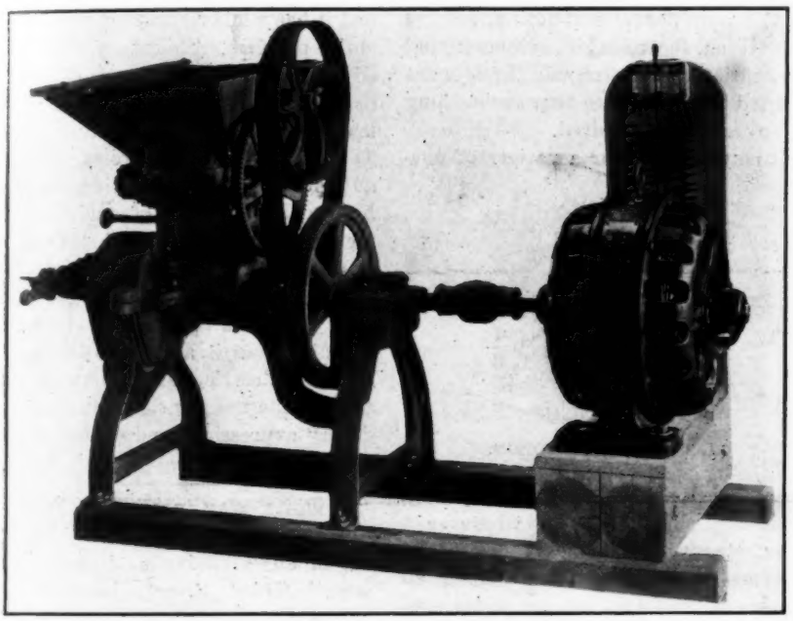
To give an idea of the happenings of a crowded week, mention may be made of the inspection trips through Cleveland lamp factories, and of the numerous papers and addresses, all of which were freely and thoroughly discussed. H. B. Vanzwoll, of Chicago, secretary of the Sunbeam Company, gave the opening address; J. E. Randall spoke on the work of the National Electric Lamp Association's development laboratories; E. W. Rockefeller, of the Western Electric Company, gave an informal talk on the inter-relation of the incandescent lamp and the various other lines carried by the Western Electric Company, and referred to the Sunbeam lamp as one of the company's million-dollar lines; P. F. Bauder spoke on "The Proper Lamp for the Circuit;" Roscoe Scott read a paper on "Editorial Publicity;" Ward Harrison reviewed the competitive-illuminants situation, and G. S. Merrill spoke on "Central-Station Rates." Interesting and highly instructive talks were also given by C. Walter Jones, A. W. Freund, T. J. Rider, Jr., J. G. Henninger, T. W. Simpson, C. A. Bisonnette, L. D. Collins, J. M. Donahue, C. L. Wells, L. J. Brown and F. W. Koch.

The entertainment features of the conference included a theater party on Tuesday evening, a baseball game between the New York and the Chicago representatives on Wednesday afternoon which was won by the former, and a smoker on Thursday evening at the National Club.

Motor-Driven Grain Mill.

Electricity is becoming more and more of a factor on the farm, and especially those farms which can easily procure central-station power. The accompanying illustration of an electrically driven No. 2 Kelly Duplex mill is an excellent and popular example of the advantages of electric drive and another factor in building up the day load.

The mill is the product of the Duplex Mill & Manufacturing Company of Springfield, O., and is a great favorite with feed dealers, farmers and stock-feeders. It will grind any kind of grain, cotton seed, corn cobs and shucks, and produce a grist of any desired quality, coarse, medium or fine. The grinding surface is just double that of the ordinary mill, owing to a double set of grinders or burrs, for which reason it is called the Duplex.



MOTOR-DRIVEN GRAIN MILL.

A device is provided to permit regulating the feeding of small grain from the base hopper into the crushers. This prevents the grain from clogging in the hopper and causes an even and ready flow.

The application of electric drive insures a maximum capacity for grinding with the least operating expense and affords an efficient and reliable source of power at all times. This mill is driven by a 7.5-horsepower alternating-current induction motor manufactured by the Westinghouse Electric & Manufacturing Company.

Apparatus for Artificial Respiration.

An epoch-making invention for promoting artificial respiration has been patented by K. A. Fries, of Stockholm. Hitherto the work of producing artificial respiration has been most arduous and trying, and when the time taken to produce satisfactory results is taken into consideration, it will readily be seen that the operator must be possessed of great muscular strength.

The Fries apparatus can be readily adjusted to any size subject from a child to a full-grown man, and can be operated with one hand, leaving the other free to draw forward the tongue of the patient, or any other necessary process.

The apparatus consists of a wooden shield, with head-piece, attached to which is a light steel frame with cross-bar adjustable by automatic clamps for any length of arm. A canvas girdle or band for compressing the chest is provided with eyelets for regulating to any desired size. The apparatus when not in use can be folded to occupy a space of 3 by 2 feet by 4 inches, and can be hung on the wall or kept in any handy position. To bring it into operation it is only necessary to lay it on a table and extend the steel frame. The patient is then placed on the shield, the wooden pillow automatically bringing the head and throat to the proper angle. The band or girdle is then placed on the lower part of the chest and adjusted by means of a hook and cord. The patient's wrists are then loosely strapped to the cross-bar at such a distance as not unduly to stretch the arms, and the hinged frame is then brought up almost at a right angle to the body of the patient. The whole of these operations can be easily and simply accomplished in twenty seconds. Two seconds more are occupied in adjusting the cords or chains to the proper tension, and the frame is then moved upwards and downwards and thus accomplishes automatically its life-saving work. The movements of the frame should be kept in time with the operator's own breathing, or about sixteen times per minute. Each upward movement of the frame compresses the chest and creates a vacuum; each downward movement draws breath into the lungs, and thus gradually restores animation. The arms are moved at the same time.

The whole apparatus is self-contained and is always ready for instant use, there being no intricate parts to get out of order. It weighs only a few pounds, and can easily be carried from place to place.

It has been used most successfully in Sweden.

Vanalium.

A new alloy has been put on the market by Standard Alloys, Limited, of London, England. This alloy, the outcome of many years of experiment, is similar in lightness to aluminum, but it can be worked like brass. It can be rolled into sheets or drawn into wire with ease, and its surface takes a high polish, which is not readily tarnished. The color of the metal is white, and on fracture it displays a fine silky grain. It is unaffected by ordinary atmospheric conditions or by sulphuretted hydrogen, carbonic acid, sulphurous or mineral waters. The weight of a given volume of the metal is about one-third that of brass, and in price it compares favorably with the latter metal, volume for volume. In casting it flows remarkably well, filling all the fine lines of the mold. It does not crystallize or become weaker by being exposed continuously to repeated shocks and vibrations. It can be forged, squirted or extruded at suitable temperatures. The alloy melts at about 650 degrees centigrade, and does not volatilize at any temperature normally produced by the combustion of carbon.

A Friction Permeameter.

This instrument was described by W. H. F. Murdock in a paper read at the recent Portsmouth meeting of the British Association for the Advancement of Science. The object of the arrangement is to keep the magnetic circuit invariable during a test, to keep the coefficient of friction constant, to have unidirectional sliding of the moving portion and no necessity to reset the specimen at each reading; to arrange matters so that the magnetic induction over the gap is as uniform as possible, so that the law of traction is fulfilled. To eliminate errors in H, the resistance of the magnetic current should be reduced to a minimum; the instrument also should be direct reading and portable. The instrument consists of a specimen of cylindrical section, magnetized by a solenoid excited by an electric current, and entirely surrounded by a hollow cylindrical yoke of iron. This yoke is divided symmetrically at the middle and the lines of induction act on this gap together with other attractive forces. If now the top portion of the yoke is rotated about the specimen as a vertical axis, and slides steadily on the lower portion of the yoke, then the torque may be measured, or the angular displacement between the zero and pointer be read while sliding is occurring. To eliminate the friction pull previous to magnetization the pointer is adjusted to read zero under mechanical friction only. Consequently when the specimen is magnetized the magentic pull is taken up on the surfaced faces and the angular displacement is due to the magnetic induction only. Therefore the magnetic induction in the test specimen can be obtained by multiplying the square root of the reading by a constant. Owing to the completeness of the magnetic circuit, tests at high inductions can be made.

New High-Efficiency Tungsten Lamp.

The Deutsche Gasgluhlicht Aktiengesellschaft, Berlin, Germany, is marketing a new "intensive-type" Osram lamp for which a very high efficiency is claimed. The lamp comes in sizes from 100 to 1,000 candlepower. A number of these lamps, of 400 candlepower, were tested at the Physikalisle-Technische Reichsaustalt for 1,000 hours on alternating current, and the average decrease in candlepower was eight per cent. All the lamps remained burning at the end of that period. The candlepower measurements were made with direct current, and at the start showed a specific consumption of 0.85 watt per hefuer unit, equivalent to 0.94 watt per candle. At the end of 1,000 hours this had increased to an average value of 1.02 watts per candle. Mean horizontal candlepower was measured. By the use of a special reflector, the mean lower-hemispherical candlepower is 1.12 as large as the mean horizontal.

New Blow Torch.

The Solderall Company is now introducing, in connection with its "Solderall," a new pocket self-acting, alcohol blow torch, shown in the accompanying illustration. This torch will throw a hot pointed flame three to four inches long in any direction desired.

It may be used for a variety of purposes, such as soldering, vulcanizing, removing paints, etc., or wherever a long, steady, hot flame is desired. It has met with great favor among all classes of trades on account of its compactness, its cleanliness, leaving no soot and requiring no pumping or blowing. This torch is manufactured by the Solderall Company, New York, N. Y.

ALCOHOL BLOW TORCH.

Mercury-Vapor Light for Sterilizing Milk.

United States Consul Frank W. Mahin, of Amsterdam, Holland, states that a local periodical dwelt on the effect of ultra-violet beams on bacteria and to the fact that such beams are abundantly developed by quartz-tube mercury-vapor lamps, and relates that through this medium milk may now be sterilized in a few minutes. An apparatus has been constructed whereby the milk flows in a thin stream along such a lamp. Demonstrations were first made with water infected with different kinds of bacteria, and it is said that the water was purified in a few minutes, without appreciably increasing its temperature.

Data on Street Lighting.

There is probably no single aspect of central-station service that is receiving more attention today than that of street lighting. So many municipalities, boards of trade, business men's organizations and other civic and engineering organizations are interested in this matter that the campaign for improved street illumination is rapidly becoming nation-wide.

In this connection the Sterling Electrical Manufacturing Company of Warren, O., makes an interesting announcement. This company has for a long time been in the vanguard in the matter of improved street illumination and it has made a coherent study of the entire problem. This study has extended over a considerable period, and the data secured constitutes probably the last word on this interesting subject. The company has compiled this data and prepared a compendium on street lighting for the use of engineers, municipal authorities, central stations, civic organizations and others interested in improving street-lighting conditions. This volume is for pure service and so valuable does it appear to be that the Sterling Electrical Manufacturing Company is the recipient of many commendatory expressions and congratulations upon its enterprise.

White Way in Niagara Falls.

Niagara Falls, N. Y., has joined the list of cities having a "great white way." Third Street, between Falls Street and the bridge, now has an illumination of which the citizens are proud. It was secured by the activity of the Third Street Business Men's Association. The first illumination took place about a month ago, the occasion being signalized by a parade and celebration. Tungsten lamps, inclosed in globes, and mounted on Morris Iron Company's posts, were used. There are five lamps on each post.

Aluminum Furnishes New Abrasive.

A new artificial abrasive "corubin" has recently been put on the market abroad. The material is produced from the slag resulting from the reaction between aluminum and chromium oxides. It is practically pure alumina containing a trace of chromium oxide, which gives it a red color. On account of the high temperature at which it is manufactured it is free from combined moisture. It is produced in three grades, coarse, medium, and fine.

New Designs of Cable End Bells and Busbar Supports.

Power-house experience in the last few years has shown the great importance of careful attention to details of design and construction in electrical fittings for high-tension and even medium-tension cable leads, busbars, auxiliary wiring, etc. Among manufacturers of such specialties, the Electrical Engineers' Equipment Company, of Chicago, has given particular attention

FIG. 1.—END BELL FOR INSIDE SERVICE.

to this line of supplies and, as the result of close study of the requirements, has produced many new designs of fittings to meet these requirements exactly. Space will permit mention of only a few of these in this article.

Among the cable end bells there are quite a few new types. Fig. 1 shows an end bell made for all sizes of single-conductor, lead-covered cable up to 7,000 volts and intended for inside service. The bushing on top is made of wet-process porcelain. The bottom of the bell has an outside clamp for attaching to the cable when an iron-pipe

FIG. 2.—END BELL FOR OUTSIDE SERVICE.

conduit is not provided. Another new bell for single-conductor, lead-covered 7,000-volt cable is shown in Fig. 2. This bell is for outside service and has a special two-part "Y" connector so arranged that, after the incoming lead has been soldered to the bottom part, the outgoing lead can be soldered to the other part and both bolted together. This permits any size of cable to be used on the sharp angle shown, which could not be done if the cable had to be bent to a radius necessary for the larger cables. Up to 2,000,000-circular-mil cable can be used. Both the cable bell and its con-

FIG. 3.—END BELL FOR THREE-CONDUCTOR CABLE.

nections are detachable. The bell is equipped with the inside clamp device and is arranged for connection to iron conduit.

A very compact cable bell for inside

FIG. 4.—END BELL FOR FOUR-CONDUCTOR CABLE.

service is shown in Fig. 3, as adapted for three-conductor cable carrying 7,500 to 16,500-volts delta potential. It is also made for two or four conductors and is arranged to screw on to iron-

FIG. 5.—INSULATOR PIN.

pipe conduit. Fig. 4 shows a type of end bell adapted for outside service on four-conductor, lead-covered cable supplying up to 13,200-volts delta. Both the types in Figs. 3 and 4 are equipped with the patented inside ground clamp, whose construction was described in these columns in the issue of November 5, 1910. It will be recalled that this clamp is designed particularly to afford a reliable discharge path to the static electricity that accumulates at the end of cable sheaths or armor. This inside clamp device is very easily

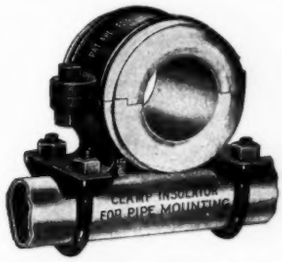


FIG. 6.—NEW CLAMP INSULATOR FITTING.

installed without wiping of lead joints or other troublesome features. It gives an added value to the end bell, for the latter serves not merely to exclude moisture, but to overcome the troublesome static effects which have caused so many cable breakdowns.

In Fig. 6 is shown a new clamp insulator fitting for mounting on 1.25-inch standard iron pipe and suitable for bare cables carrying up to 2,500 volts or for solid round or tubular busbars.

Fig. 5 shows an insulator pin for

FIG. 7.—PIN FOR BUS COMPARTMENTS.

cementing into any upright insulator of 22,000 volts or above. The pin is of one-inch extra heavy pipe of any height and is made to fit any size of thimble. The thimble and base part are of malleable iron; the solid base shown clamps seven inches on the pipe. The lower base clamp has steel set-screws to prevent the pin turning.

A malleable iron pin for mounting high-tension bus compartments is shown in Fig. 7. The pin head fits any size of thimble.

Making Belts Waterproof.

Transmission of power through shafting under favorable conditions is more efficient than is generally supposed. Much depends upon the care exercised in hanging the shafting and in the arrangements of the pulleys, and, more important still, the tension in the belts.

In tropical regions some belts have been known to change length six inches in one day. Humidity is the principal cause of trouble when the belts are not waterproof. Where slight initial tension is needed the belt must, therefore, be waterproof to give best results.

It is not necessary to buy rubber or special waterproof belts for drives where an ordinary leather belt is preferable. Ordinary leather belts can be made immune to damp or steamy surroundings or to the actual slopping of water on the belts by proper application of "Cling-Surface," a new waterproofing material.

A belt with riveted joints, treated with Cling-Surface, is said to be made absolutely waterproof and could be run submerged in a water pit. This has been proved in instances where for several days floods buried belts treated in this manner. The preservative treatment rendered them immune in even such severe cases. A cemented belt, excepting the edges of the seam, is also waterproof, and although it might not withstand prolonged submerging, it will successfuly resist dampness and steam.

Electric Manufacture of Steel.

An application of electricity to metallurgy will shortly be carried out on Tyneside (Eng.), where a new industry is being established by the Electro-Flex Steel Company, Ltd., a syndicate recently promoted for the manufacture of steel entirely by electrical methods. A site of about three acres has been acquired, and arrangements have been made to obtain the supply of current from the County of Durham Electrical Power Distribution Company. The initial installation will consist of two 200-kilowatt Stassano electric-arc furnaces of the latest pattern, each having a capacity of one ton per charge. The company will, it is understood, confine its operations, in the first instance, to the manufacture of high-grade castings of weights ranging from 101 pounds to about 300 pounds.

A Unique Advertising Device.

A reputation for producing business-getting advertising is sometimes uncomfortable because it is hard to live up to. The Bryant Electric Company, of Bridgeport, Conn., has such a reputation and its latest piece of advertising matter is sufficiently ingenious to deserve special notice; a general illustration of it appears herewith. It is devoted to its interchangeable line of "New Wrinkle" sockets, switches and other wiring devices, and consists of a heavy base card fourteen by twelve inches to which is attached a revolvable disk ten inches in diameter. The various bases and caps which make up the line are printed on the base card

UNIQUE ADVERTISING DEVICE.

and the shells on the disk. This permits each of the twenty shells to be brought against any one of the twenty-six caps and bases, and when this is done the catalogue or style number of every one of the 520 complete articles formed by the union of the two parts shows through a slot in the disk. On the reverse side of the heavy card is an index of catalogue numbers which includes standard package quantities and list prices.

In practice it would seem as if this unique advertisement would be of great benefit to the Bryant Electric Company and its distributors. Credit for originating as well as working out this clever scheme is due Frank V. Burton, the energetic Eastern sales manager of the company, who likewise directs all of its publicity work.

A Telephone Train-Dispatching System Paralleling a High-Tension Transmission Line.

The New York, Westchester & Boston Railroad is now installing a telephone installation which is particularly interesting because of the fact that it is the first installation of a telephone train-dispatching system paralleled by high-tension, single-phase circuits. The method of protecting the telephone user, keeping the cable drained from induced currents from the transmission line, and at the same time giving standard transmission, is a problem which will be appreciated by those who have endeavored to operate telephones when used in connection with high-tension distribution.

The telephone system will be complete, consisting of train-dispatchers' circuits and message-wire circuits of various kinds. All the circuits, with the exception of the train wires, will be provided with intercommunicating features.

As this road is electrically operated, using 11,000-volt, twenty-five cycle, single-phase energy, it was thought best after a considerable amount of engineering investigation to make the distribution system of underground cable, and, accordingly, a four-duct subway is now being constructed between One Hundred and Eightieth street, West Farms, and Columbus Avenue tower, Mt. Vernon. At that point the road branches off, extending to White Plains, a distance of approximately eight miles. Over this branch, and also over the New Rochelle branch, which extends three miles from Columbus Avenue Junction, a three-duct subway will be built. The layout for the complete telephone system had to be designed for future extension.

The dispatcher's office will be located at One Hundred and Eightieth Street Station, as will also the message operator, who will monitor the various message circuits and have charge of the local telephone service through a special switchboard. This special switchboard, all of the telephone selector equipment for the circuits, the wire, conduit, cable, and, in fact, the complete equipment, was furnished by the Western Electric Company.

Current Electrical News

CANADA.

(Special Correspondence.)

OTTAWA, ONT., OCTOBER 4.—Another gigantic power concern is receiving a charter from the Ontario Government under the title of The Mexican-Midland Light & Power Company, of Toronto, with a capital of $15,000,000.

The commencement of a new era has been marked in practical farming in Canada. A short time ago the chairman of the Ontario Hydro-Electric Commission, Hon. Adam Beck, went to the farm of John Krouse, in West Oxford, Ont., and in the presence of many representative farmers, turned on the electricity to run motors for cutting corn, for the preparing of the soil and other farm uses. This is the first time in this country that electric power has been used for general farm work.

The Commission, which will deal with navigable conditions on the St. Lawrence River, has been announced by the Dominion Government. The duties of the new organization will be to examine conditions prevailing in the river and to report the many electrical power schemes now before the government, and the effect of such works upon the navigation of the river.

The directors of the Marconi Wireless Telegraph Company, of Canada asks authority from the Dominion Government to create and issue $2,500,000 thirty-year first-mortgage six-per-cent gold bonds. It is proposed to issue $1,000,000 worth at once, and the directors expect to sell these bonds at an early date, and the proceeds will be used to pay off the indebtedness of the company, the balance to remain in the treasury.

The important announcement is made by the Department of Public Works, here, that it has approved of the plans of the Cedar Rapids Manufacturing Company for its works on the St. Lawrence River. It was explained to the department that the undertaking does not involve objections similar to those urged against the Canadian Power proposition at Beauharnois, nor such as were taken to the Long Sault project. The matter will be dealt with by the new Canadian Government, but meanwhile the Cedar Rapids proposition can go ahead.

The Canadian Light & Power Company has at last become a factor in the power situation in the city of Montreal. After much opposition and a great many interruptions the company started to fill contracts amounting to about 15,000 horsepower. The company is now operating two units of 7,600 horsepower each, and is transmitting power direct from the St. Timothy power plant into the terminal station at Cote, St. Paul, where it is distributed to the local consumers. In a short time a third unit of 7,600 horsepower will be available, and the company is proceeding at once to lay the basic work of a fourth like unit, which will give a capacity of 30,000 horsepower.

MEXICO.

(Special Correspondence.)

MEXICO CITY, MEX., September 30.—The Mexican Northern Power Company, composed of Canadians, which is constructing a great hydroelectric enterprise on the Conchos River, about twenty miles from Santa Rosalia, now has more than 1,000 men employed in the work. The dam is partly finished. Besides storing water for operating the proposed hydroelectric plant which is to have a capacity of about 50,000-horsepower, it will be the means of affording a water supply for irrigating 200,000 acres of land, situated in the valley of the Conchos River. The company is operating under favorable concessions granted by the State and Federal governments. It began construction work about two years ago and carried it on steadily until the outbreak of the revolution last fall. For several months a shortage of labor interrupted operations but this condition is now relieved and it is announced that the big enterprise will be finished by June, 1913. The project involves the expenditure of about $15,000,000 gold, making it one of the most important foreign industrial works now in progress in Mexico. In order to afford transportation facilities for conveying material and supplies to the construction camp a standard-gauge railroad was constructed from Santa Rosalia to the dam site, a distance of twenty-two miles. The electric transmission lines from the hydroelectric plant will run to the cities of Chihuahua, Parral, Jiminez and a number of smaller towns as well as to all of the principal mining camps in a big portion of the state.

An English company is said to be constructing a large power plant at Micos Falls. Houses have been erected and work commenced. A small dam is being built and a tunnel will carry the water through a mountain side from the dam to the power plant, thus assuring safety during floods and a perfect control of water at all times. Work has been commenced on a tunnel through the mountain, and it is said that the company will build a railroad to connect with the National Railroad for handling the machinery. It is said that the company will expend $6,500,000 gold in constructing the power plant and transmission lines and that the power will be transmitted to Tampico and to San Luis Potosi.

COMMISSION NEWS FROM NEW YORK.

(Special Correspondence.)

A booklet which has been published by the Public Service Commission reviews in a comprehensive manner the work done by the two bodies since their inception. An excellent idea is given of the powers and scope of the bodies.

The two Public Service Commissions created by the Legislature in 1907 on the recommendation of Governor Hughes were given broad powers for the regulation and control of corporations under their jurisdiction. The Commission for the First District was also invested with the powers of the Board of Rapid Transit Railroad Commissioners to lay out and build rapid-transit lines in New York City.

Rapid-transit work takes more than three-quarters of the time of the Commission and is responsible for more than sixty per cent of its expenses. Out of about $1,000,000 expended each year approximately $650,000 goes to rapid-transit work. The supervision and regulation of public-service corporations costs from $350,000 to $400,000 a year.

When the Commission came into existence the subway consisted of 22.12 miles of road and 72.49 miles of track. Extensions during the four years since have brought the road mileage up to 26.33 and the track mileage up to 85.31. The number of cars used in the subway has increased from 794 in 1907 to 1,129 in 1911.

The annual revenue car mileage has increased from 37,184,940 in 1907 to 57,110,868 in 1911. The number of revenue passengers carried has increased from 166,363,611 for the year ended June 30, 1907, to 276,704,796 for the year ended June 30, 1911, an increase of more than 110,000,000 in four years. The average daily number of passengers in 1907 was 455,789 and in 1911, 758,093, an increase of 302,304.

INTERSTATE COMMERCE COMMISSION NEWS.

(Special Correspondence.)

A question involving the right of the Interstate Commerce Commission to take up the matter of practice and fares of street-car companies has been raised by citizens of several suburbs of Washington, D. C. It was formerly the practice of the local company to extend the city fare to these suburbs, but recently an additional five-cent fare has been added, although these suburbs are not more than one-half a mile outside the limits of the District on the Maryland side. Following the one fare charged some years ago a commutation fare was put into effect, but this has been superseded by the limit of the zone fare prescribed by the Maryland statute plus the District of Columbia fare, thus making a combination of the locals instead of a joint through rate. Complaints have been filed with the Commission.

The trolley roads take the position that the new rate for the haul in Maryland is compelled because the Maryland statute forbids free transportation such as the companies had been giving passengers for the near-by suburbs and the interstate commerce law forbids free transportation in territory subject to its jurisdiction.

IMPORTANT DEVELOPMENT

(Special Correspondence.)

NEW MEXICAN IRRIGATION PROJECT.—Preliminary steps have been taken by the Virtue Mining Company and the farmers of San Simon Valley, near Rodeo, N. M., for the installation, by the former concern, of a large hydroelectric plant and the construction of an extensive system of transmission lines through the valley to provide power for operating irrigation pumps upon the farms. Officers of the company met with the farmers at Rodeo on September 23 and discussed the proposition. The proposed hydroelectric plant will be located in Clear Creek Canyon. The canyon runs back four or five miles, where it forks, one fork running to the falls, which are several hundred feet high and afford an enormous amount of water power. The grade leading up to the falls is about 1,000 feet to the mile, which enhances the possibilities for utilizing the water for power purposes. The San Simon Valley is underlaid with a basin of water at a shallow depth and considerable development in the matter of bringing this water to the surface by wells upon which pumps have been installed has already been accomplished. It is planned by the Virtue Mining Company to run a network of electric transmission lines through the valley so that the power may be utilized for operating the irrigation pumps. D.

LIGHTING AND POWER.

(Special Correspondence.)

MORRIS, MINN.—The installation of an electric light plant is being agitated. C.

COLLINSVILLE, OKLA.—This city has voted bonds for $45,000 for a light and power plant.

ROCKFORD, IOWA.—C. W. Walker has applied for a twenty-year electric light franchise.

CORYDON, IOWA.—This city is to at once begin the construction of an electric light plant.

UNIONVILLE, MO.—This city is about to reconstruct and extend its electric light system.

DERMOTT, TEX.—The Dermott Townsite Company is figuring on installing an electric light plant.

PLYMOUTH, WIS.—Bonds for $20,000 will be issued for the rebuilding of the electric light plant. C.

GRAVETTE, ARK.—This city is about to issue bonds for $25,000 and will put in an electric light plant.

DEEP RIVER, IOWA.—Bonds have been voted here for the installation of an electric lighting system.

TERRY, MONT.—E. H. Phillips has made application for a ten-year electric light and power franchise.

REDFIELD, IOWA.—Electric light and waterworks bonds to the amount of $15,000 have been voted here.

WATTS, CAL.—The Pacific Light & Power Company has been granted a fifty-year franchise in this city.

CHOTEAU, MONT.—Mr. McCullough has commenced work on the installation of an electric light plant here. C.

CORPUS CHRISTI, TEX.—The People's Light Company is preparing to enlarge its plant and extend the system.

EL CENTRO, CAL.—Plans are under way in Calexico for the installation of a municipal electric lighting system.

COLFAX, IOWA.—A. J. and F. L. Breeden have incorporated the Colfax Electric Light Company, capital $35,000.

THE DALLES, ORE.—N. C. Evans has applied for a franchise for an electric power and light system for this town.

PERRIS, CAL.—Fred B. Mechling has been granted a franchise for an electric light and power system in this city.

GRIDLEY, CAL.—The Gridley Produce & Canning Company plans for the erection of an electric light and power plant.

ABERDEEN, WASH.—Plans for the establishment of a municipal electric lighting system are now before the City Council.

LEPANTO, ARK.—The Lepanto Electric Light & Telephone Company has been incorporated with a capital stock of $2,500.

DEVIL'S LAKE, N. D.—A vote will be taken November 6 on issuing bonds for $33,000 for a municipal electric light plant. C.

COLUMBUS JUNCTION, IOWA.—R. D. Parks, of Lake Crystal, Minn., proposes to install an electric light plant at a cost of $15,000.

ANAHEIM, CAL.—The city has awarded a contract to W. W. Scott for the erection of an addition to the municipal power plant. A.

VAN HORNE, IOWA.—This city has voted $10,000 in bonds for the construction of a light plant, the old plant having been burned.

CHIHUAHUA, MEX.—The Eureka mine contemplates the installation of electric hoisting machinery. Edmund Putnam is manager. A.

PRINCE ALBERT, MAN.—Cecil B. Smith, engineer, Winnipeg, Man., has prepared plans for a municipal power plant to cost $250,000. C.

OLYMPIA, WASH.—The State Board of Control has taken bids for the installation of an engine-generator set in the Capitol Building. A.

ARBUCKLE, CAL.—The Northern California Power Company plans for the construction of power lines from Williams to Arbuckle and Grimes. A.

HUSUM, WASH.—The Pacific Power & Light Company has made application for a franchise for a power line from this city to Underwood. A.

MEDFORD, ORE.—The Southern Oregon Electric Company has been awarded the contract for installing a street lighting system in this city.

FAIRLAND, OKLA.—Machinery has been ordered for an electric light plant which is to be installed here. L. D. Long is at the head of the venture.

RANDSBURG, CAL.—The Southern Sierra Power Company has commenced construction on a power line to serve the Randsburg mining district. A.

MINNEAPOLIS, MINN.—The board of tax levy appropriated $7,500 for the installation or ornamental lighting on Washington and Nicollet Avenues.

JACKSON, CAL.—The Amador Electric Light & Power Company has completed its new substation at Jackson, for the local electric lighting system. A.

CHARLESTON, S. C.—Bids are to be received until Otcober 18, for lighting the streets of this city. There will be required a total of 300 arc lamps.

JAMESTOWN, CAL.—The Rio Tagus mine is said to be contemplating the erection of a hydroelectric power plant on Knight's Creek, near its property. A.

PASADENA, CAL.—W. A. McNally & Company has been awarded a $30,400 contract for installing an electric lighting system in certain sections of this city.

NASHUA, IOWA.—The Nashua Power Company has been incorporated by W A. Granger, G. T. Greeley and G. E. Hoger, with a capital stock of $21,000.

VENICE, CAL.—The Abbott Kinney Company (Abbott Kinney, president) is planning for the erection of an electric lighting plant to cost approximately $100,000. A.

WACO, TEX.—The City Commission has entered into contract with the Waco Gas & Electric Company for the installation by the latter of 100 additional arc lights.

FARMINGTON, MINN.—An electric light and power company, with a capital of $100,000, has been organized. A. H. Sprute is president and J. S. Lewis secretary. C.

LOS ANGELES, CAL.—The C. C. Moore Engine Company has been awarded the contract for installing an electric generating plant in the Hall of Records at $21,000.

PORTAGE LA PRAIRIE, MAN.—The contract for the additions to the municipal electric light plant, including two 225-horsepower engines, .was let to Alex McDarty. C.

WEAVERVILLE, CAL.—The Trinity Dredging Company has been granted a fifty-year franchise for an electric transmission line on the public highways of the county.

DURANT, OKLA.—The City Council has accepted the new city light plant and it is now in operation. The city plant will compete with the Durant Ice & Light Company.

COTTONWOOD, CAL.—The Sacramento Valley Power Company contemplates the construction of a transmission line from this place to the gold dredging field on Dry Creek. A.

CORONA, CAL.—Construction-engineer Forbes, of the Sierra Light & Power Company, is now preparing plans for the entire reconstruction of the plant and lines at this place.

LAMAR, COLO.—The Associated Engineers Company of Denver and Colorado Springs men has acquired the power plant here. T. L. Wilkinson, of Denver, is president of the company.

ENDICOTT, N. Y.—The Endicott Light, Heat & Power Company has been incorporated with a capital of $5,000, by Perkins & Blakeslee, Lewis S. Nattoon, Isaac E. House and J. Winfield Tiffany.

DENTON, TEX.—New machinery, including a 200-kilowatt direct-connected generator and a 300-horsepower engine, will be installed in the municipal light and power station at a cost of $10,000. D.

CHELAN, WASH.—The Great Northern Railway is said to be planning for the erection of a hydroelectric power plant on the Chelan River, near Chelan. H. M. Herzog, engineer, Seattle, is in charge. A.

DORRIS, CAL.—The Siskiyou Light & Power Company will furnish this town with light and power within a short time. The substation has already been erected, and a fifty-year franchise asked for.

ESTELLINE, S. D.—A new electric light system has been installed here and rapidly is being extended to all parts of town. The City Council has ordered twenty-seven lights to be placed on street crossings.

PRESCOTT, ARIZ.—The Arizona Power Company will construct a transmission line from Poland Junction to Crown King, by way of Mayer. R. S. Masson, Los Angeles, Cal., is engineer for the company. A.

PASCO, WASH.—The City Council has awarded a contract for the installation of eighty-six ornamental cluster lights, three lamps to the post. The fixtures will be placed in the business and residence district. A.

THIEF RIVER FALLS, MINN.—Dr. Henry Grundy, Alderman Torrison and Martin Evenson are a committee to investigate the feasibility of installing an oil, instead of steam, auxiliary plant at the power station. C.

PORTLAND, ORE.—Architects Doyle, Patterson & Beach are preparing plans for a twelve-story addition to the Oregon Hotel, to cost about $500,000. A complete electric lighting and power plant will be installed. A.

CHRISTOPHER, ILL.—The Christopher Electric Company has been incorporated with a capital of $20,000 to operate a plant in this city. The incorporators are Thomas Horn, Albert E. Pike, H. M. Rea, and T. D. Parkhill.

CONNERSVILLE, IND.—The Hydro-Electric Light & Power Company has incorporated with a capital stock of $100,000 to do municipal lighting. The directors are E. D. Johnston, Lewis R. Johnston and J. M. Shade.

RALEIGH, N. C.—A lighting and power plant is being installed

in the Central Hospital for the Insane, involving an expenditure of about $6,500. The power supply is now being received from the Carolina Light & Power Company.

BAROGA, MICH.—Contracts will be let for the work on a waterworks system and electric light plant for this city, at 2:00 p. m., October 16. The Oscar Claussen Engineering Company, St. Paul, Minn., has the work in charge.

SAN BERNARDINO, CAL.—The Southern Sierra Power Company, now building a transmission line from Bishop to this city, plans for the construction of a branch power line from San Bernardino to Oro Grande, on the Mojave River. A.

KENNETT, CAL.—The Sacramento Valley Power Company has completed its new transmission lines to this district and is now supplying power. The entrance of this company into this section is said to mean a reduction in rates. A.

VALLEJO, CAL.—An election will be held the latter part of October or the first of November to decide whether or not a $225,000 bond issue for municipal improvements shall be made. $150,000 of this is for a municipal electric light system.

PHOENIX, ARIZ.—Plans for Power House No. 2, on the South-Consolidated Canal, are now in the hands of the Water Users' Association. A 3,000-horsepower generating plant will be installed, electrical apparatus having already been ordered.

COLUMBUS, O.—A sum of $22,000 for use in installing an ornamental system of street lighting became available a short time ago. While some of the work will be done this fall it is probable that the installation will not be completed before spring.

ADAMSTOWN, PA.—The Adamstown Electric Company has been incorporated to furnish light, heat and power for this borough. The capital stock of the company is $5,000. The incorporators are Walter A. Rigg, George L. Roller and H. H. Reigel.

PORTLAND, ORE.—The Ewbank Power Transmission & Motor Company has been incorporated by H. B. Ewbank and G. Staples, with a capital stock of $250,000. The company plans to develop power, and construct an electric railway system, near Portland. A.

LYLE, WASH.—The Northwestern Electric Company, of Portland, has awarded a contract to the Puget Sound Bridge & Dredging Company for the construction of a dam on the Klickitat River, near Lyle, to be used in connection with its proposed hydroelectric power plant. A.

RICHMOND, VA.—Application has been made by the Richmond & Henrico Railway Company for permission to sell light and power along the streets over which the line operates. If permission is granted, the company expects to make extensive improvements in its system.

OSKALOOSA, IOWA.—Capitalists representing the Des Moines River Power Company, are trying to interest local people in a Des Moines River project. It is planned to build a dam near here for the purpose of generating electricity to run plants here and in Albia, Buxton and other points. C.

VERMILLION, ALTA.—C. V. Caesar, town clerk, will receive bids up to noon October 16, for a municipal light plant, including one seventy-five-horsepower steam engine and boiler and one fifty-kilowatt, alternating-current generator and switchboard. Boweing & Logan, of Toronto, Ont., are the engineers.

WINNIPEG, CAN.—The new municipal electric plant at Point du Bois, seventy miles from the city, was recently started. At present it supplies, from the Winnipeg River, to this city 60,000 horsepower, but steps have been taken to insure double that amount when needed. The cost of the plant was $5,000,000.

CALISTOGA, CAL.—The Calistoga Electric Company has been incorporated with a capital of $25,000 by C. W. Crouch, E. M. Billings and D. R. Wedamand. The company will obtain electric energy from the Napa Valley Electric Company at Bale, and will distribute for lighting and power in the Napa Valley district. A.

FRESNO, CAL.—Upon the application of the Pacific Light & Power Company, of Los Angeles, the Board of County Supervisors is advertising a notice of sale of a pole and wire franchise from the San Joaquin River to designated sections of the county for a term of fifty years. Bids will be received up to November 7. A.

STEVENSON, WASH.—The Skamania Light & Power Company has applied for a light and power franchise at Hood River, Ore. A reduction of fifty per cent in present rates is offered. The company is also planning to install a system at Vancouver, Wash., and will soon request a franchise. Samuel Samson is head of this company. A.

PORTLAND, ORE.—A company headed by M. A. Moody of The Dalles, and Le Roy Park of Portland, has organized with a capital of $1,000,000 under the name of the Deschutes-Rimrock Power Company, to develop power on the Descutes River. The plants will be built at the mouth of the river so as not to interfere with the Government's operations.

VINCENNES, IND.—Judge Anderson of the Federal Court has annulled the lease of the property belonging to the Black Hawk Light, Heat & Power Company which has been held by the Vincennes Light & Power Company, and also discharged the receiver. The officials of the Black Hawk Light, Heat & Power Company announce that they will extend and improve the plant and operate the same for the distribution of current and gas to consumers. S.

BOWLING GREEN, O.—Receivers B. C. Harding and E. A. Royce of the Lake Erie, Bowling Green & Northern Railway Company, have secured authority from Federal Judge Killits to expend $50,000 in improvements. The local lighting plant will be rebuilt to accommodate a city four times the present size of the town. The city will be asked to renew the present franchise which expires in November. H.

KENTON, O.—Officers of the Hardin-Wyandotte Light Company have given assurances that a new lighting plant will be built here according to the agreement made nine months ago when the franchise was extended a period of nine years making it a twenty-five year franchise. Work has been delayed on account of a suit for $170,000 brought by Kerlin Bros., of Toledo, against the stockholders of the old company. H.

LOS ANGELES, CAL.—The Finance Committee of the City Council is considtring a $6,000,000 bond issue for the purpose of purchasing the property of the Pacific Light & Power Company, the Los Angeles Gas & Electric Corporation and the Southern California Edison Company. In case these companies decline to sell it is proposed that the city lay its own conduits and parallel those of the three companies.

DORRIS, CAL.—The Siskiyou Electric Light & Power Company has made application for a franchise for lighting and power at Dorris for a period of fifty years. The trustees will meet for this purpose on November 6. The company is also planning extensive additions in its transmission system in Southern Oregon, and will connect its subsidiary plants with its main generating station on Fall Creek, near Keno, Ore. The company maintains headquarters at Yreka, Cal.

WEST TERRE HAUTE, IND.—The introduction and installation of electrical machinery in the coal mines in this state is attracting favorable attention by all the big operators. A 300-kilowatt generator is being installed in the Deep Fourth Vein Mine near this city. It is expected that the new electrical machinery will be the most powerful and modern of any in the state. The new motor which will be put in operation in a short time will increase the capacity of the mine to 1,500 tons per day. S.

PHOENIX, ARIZ.—The Salt River Valley Water Users' Association has awarded contracts as follows: John Roebling Company, copper wire, and galvanized telephone wire; B. F. Kierulff, Jr., Company, Los Angeles, 100 steel poles; Pierson, Roeding & Company, Los Angeles, 350 insulators; Wesco Supply Company, galvanized guy wire, copper splicing sleeves, 30 clamps, and 225 telephone insulators; Maris Brothers, Philadelphia, two traveling cranes, for the South Side power station. Additional bids for miscellaneous material were opened October 3, and contracts will soon be awarded. A.

MONTROSE, COLO.—It is probable that Montrose will be made the central distributing station for electric light and power for the towns of Ouray, Delta, Ridgway, Hotchkiss and Paonia. A proposition has been made to the City Council requesting that a franchise of the Montrose Electric Light & Power Company be extended for a period of twenty years on the guarantee that the company will proceed at once to the expenditure of over $100,000 in enlarging the present plant. The company also agrees to reduce the cost of light and power at least fifteen per cent. The local company is owned by the Federal Light & Traction Company of Denver.

BRISTOL, TENN.—The statement is made by Lee F. Miller, president of the Watauga Power Company that the power plant at Horseshoe Bend on the Watauga River, twenty-five miles from Bristol, will be in operation in a short time. The cost of the new enterprise is about $250,000. This includes the cost of constructing an aluminum transmission line from the plant to Bristol. Generators and auxiliary apparatus have been installed for the development of 3,000-horsepower. The Bristol Gas & Electric Company is under contract to take 2,000-horsepower of the current to be generated. Already a considerable portion of this has been sold to Bristol manufacturers, so that most of the industrial plants here will be operated by electricity.

ROSWELL, N. M.—The Berrendo Irrigation Company which is developing a tract of about 14,000 acres of land near here has made a contract with the Roswell Light & Gas Company for supplying the farmers upon this land with electric power for operating the irrigation pumping plants. The company has finished the construction of forty-five miles of power-transmission lines through the property and will enlarge the system until all of the land is provided with power. The contract limits the charge for power to $1.25 per acre foot of water and provides that there shall be a corresponding decrease in proportion to the number of irrigators on the land and the amount of power used. The pumping plants are situated upon shallow wells, the lift being from five to thirty-five feet. All of the pumps are of the six-inch centrifugal type and each is operated by twenty-five-horsepower motors directly connected. The Roswell Light & Gas Company will enlarge its plant to 1,500-horsepower. It will install two new 750-horsepower producer gas engines, and the new plant will be so constructed that a second unit of similar size may be easily installed. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

KALISPELL, MONT.—David R. McGinnis is planning the construction of electric lines to Somers, Bigfork and Whitefish. C.

LOS ANGELES, CAL.—The Pacific Electric Company has obtained a franchise for an electric line in the Yorba and Paige tract.

RAPID CITY, S. D.—The construction of a trolley line, forty-six miles long, to Newell, and estimated to cost $500,000 is projected by local business men. C.

SANTA MONICA, CAL.—The Los Angeles Pacific Company has been granted a fifty-year franchise for a double or single track electric railway in this city.

WOODVILLE, O.—The city officials have entered into a contract with the Lake Shore Electric Railway Company to furnish electric light for this village. H.

FREMONT, O.—The City Council has granted the Tiffin & Fremont interurban line a franchise on city streets. Promoters promise to have cars running between the cities by Christmas. H.

CUCAMONGA, CAL.—Officials of the Pacific Electric Railway Company have been here looking over the proposed route for an electric line from Ontario Colony through to Etiwanda.

VALENTINE, NEB.—C. H. Cornell, W. E. Haley, J. H. Bachelor, all of Valentine, and others have incorporated an interurban railroad company to build 225 miles of line to Sioux City, Iowa. C.

FORT DODGE, IOWA.—The Rock Island will expend $160,000 for the construction of the Ankeny cut-off and the electrification of the road; $40,000 for three freight locomotives and $20,000 for new terminals. C.

SAN ANTONIO, TEX.—The San Antonio Traction Company is constructing an extension of its system to Los Angeles Heights, a suburb of this city. Further extensions of the system are in contemplation. D.

LOS ANGELES, CAL.—The Board of County Supervisors is offering for sale, bids to be received up to October 30, a franchise for an electric railway from San Fernando to Pacoima for a term of forty years. A.

SEATTLE, WASH.—The Board of Public Works plans for the construction of the proposed municipal railway from Seattle to Renton, at a cost of $800,000. City Engineer Thomson has been instructed to prepare plans. A.

PHOENIX, ARIZ.—The Arizona Construction & Finance Company has been incorporated for $2,000,000. This company will operate a street railway in this city. The directors are R. A. Lewis, W. B. Barr and S. D. Dunlop.

ST. PAUL, MINN.—The St. Paul Railway Promotion Company has combined with the Interurban Construction Company of Hastings, Minn., and let the contract to Hoy & Elzy Company, for the construction of an electric line to Mankato. C.

TWIN FALLS, IDAHO.—The Twin Falls Railway Company has been incorporated by I. B. Perrine, C. Smith, D. Moorman, E. Williams, A. Stafford, of this city, and R. S. Buck and Raymond McCune, of New York, with a capital stock of $500,000.

SPRINGFIELD, ILL.—The Oak Hill Street Railway Company, of Chicago, has been incorporated with a capital stock of $20,000 to construct and operate street and interurban railways. The incorporators are Charles Pullman, I. A. Isaacson and L. S. Watts. Z.

IRONVILLE, O.—An electric line will be run to Niles Beach, five miles north of this place, and the beach will be developed into a large summer resort. A surveying force is engaged in laying out the route. A low rate of fare will be maintained with a view to rapid settlement of the place. H.

CINCINNATI, O.—The Cincinnati, Georegtown & Portsmouth and the Ohio River & Columbus railways have been consolidated. Robert Hackney, head of the Cincinnati Northern, is president and treasurer and E. E. Garbreath vice-president and general manager. The deal is said to have involved $3,000,000.

PORTLAND, ORE.—H. L. Harmon and other Chicago capitalists have organized a company to build an electric line from Vancouver, Wash., to the south fork of the Lewis River, and northwest to Klickitat Pass. In addition to the electric railroad the promoters will operate coal mines, sawmills and township properties.

SOUTH BEND, IND.—According to a statement of H. E. Bucklen, the Valley Line, running from Bristol to Angola, Ind., will eventually be electrified. He also stated the work of grading for the extension east of Angola is being rapidly pushed to completion and as soon as possible the rails will be laid and the cars running.

PHILADELPHIA, PA.—The charter for the Snyder Avenue Street Railway Company has been granted to construct and operate a street railway on Snyder Avenue, this city, a distance of 7.66 miles. Charles O. Kruger is president of the new corporation and the company is capitalized at $140,000. The new company will become a subsidiary of the Rapid Transit Company.

FAIRFIELD, CAL.—The California Terminal Company, which proposes to build an electric railroad from San Rafael to Sacramento, passing through the counties of Marin, Sonoma, Napa, Solano, Yolo and Sacramento, a distance of ninety-five miles, has filed its articles of incorporation. The incorporators are C. W. Conlisk, W. M. Rank and R. A. Morton.

VANCOUVER, WASH.—The Hood River Railway & Power Company has been granted a fifty-year franchise for an electric railway system at Vancouver. The company plans for extensions in its system in Clarke County to cost $1,000,000. The company has acquired a power site on the Lewis River, and is said to be contemplating the erection of a new hydroelectric power plant.

FORT WORTH, TEX.—The contract for grading the proposed interurban electric railway that is to be constructed between Fort Worth and Cleburne, a distance of twenty-nine miles, by the Stone & Webster Engineering Corporation of Boston, Mass., has been let to the Texas Building Company, Incorporated, Fort Worth. It is stipulated that the grading shall be finished by December 15. D.

GREENVILLE, TEX.—Jos. F. Nichols, of Greenville, who is promoting the construction of a system of interurban electric railways to radiate out of this place, has contracted with engineers for the preliminary surveys. It is planned that one of the lines shall run to Sherman, one to Cooper, another to Paris and the fourth to Dallas. It is reported that the financing of the proposed system is practically assured. D.

LOS ANGELES, CAL.—The Los Angeles Railway Company has been granted a franchise to cross El Monte Road, for a consideration of $100. This completes the company's right of way for a line from Boyle Heights to a point near Eastlake Park, and construction will be immediately commenced. The cost is estimated at $150,000. The company also contemplates the construction of a line through Elysian Park. A.

POLSON, MONT.—The Flathead Power & Traction Company has been incorporated with a capital of $150,000 to build a railroad from Polson southwesterly to Dixon, Sanders county, a distance of thirty miles. The company will also build a power plant on Hell Roaring Creek in the Mission range. The incorporators are F. L. Gray, G. R. M. Stritzel, T. R. Arnold, F. E. Faucett, M. A. Myhre and A. W. Pipes, all of Polson, Mont.

RICHMOND, IND.—The Richmond & Eastern Indiana Traction Company recently incorporated to build an interurban road to connect Richmond, Portland, Brookville, Harrison and intermediate towns has elected the following officers: Sharon E. Jones, president; Adam H. Bartell, vice-president and Charles W. Jordon, secretary-treasurer. The officers say they will be able to finance and build that portion of the road between Richmond and Portland probably this year. S.

NORFOLK, VA.—Announcement is made here by officials of the Virginia Passenger & Power Company that about $1,000,000 would be spent in improving the electric system in Norfolk recently acquired by Frank Gould, the dominating factor in the company. Included in the improvements is the erection of new steel car barns, to cost $125,000; new rolling stock, $50,000, and about $200,000 for a better track system and the erection of terminals at Ocean View and Willoughby Beach.

HOUSTON, TEX.—The Galveston-Houston Interurban Railway Company has finished the construction of its interurban line between Houston and the mainland and of the causeway that is being constructed across Galveston Bay. A test run was recently made over this finished part of the road and it proved satisfactory in every respect. The main power station is situated at League City. The causeway will be finished about November 15 and the interurban line will be opened all the way through to Galveston about that date. D.

ATLANTA, GA.—The Georgia Railway & Power Company, a concern that proposes to capitalize itself at $27,000,000, is applying to the Secretary of State for a charter to build an electric railroad and electric power plants. The company proposes to build an interurban electric trolley line from Stone Mountain, in De Kalb County, through the towns of Klarkston, Decatur, East Lake, Oakhurst, Kirkwood, Atlanta, East Point, College Park and Hapeville, with the privilege of extensions. The application also asks for authority to construct and operate electric light and power and heating plants.

PARIS, TEX.—The Board of Trade has made considerable progress in promoting the construction of an interurban electric railway between Paris and Sherman, sixty-three miles. At a recent meeting of representatives of all the towns along the route of the proposed line held at Honey Grove the sum of $25,000 was pledged for making the preliminary survey and an organization was formed to extensively promote the project. The officers are: C. B. Dorchester, of Sherman, president; Joe F. Etter, of Sherman, secretary; H. P. Mayer, of Paris, assistant secretary; J. F. McReynolds, of Paris, treasurer. D.

LOS ANGELES, CAL.—A brief section of the report of Bion J. Arnold, on the proposed municipal railway from the business district to the harbor, covering traffic conditions on Main Street, and recommending the construction of trackage on San Pedro Street, from Sixth to Aliso Streets, has met the approval of the mayor. In a message to the City Council he requests that body to arrange for the building of the road by the city, at an estimated cost of $130,000, to be leased to the local railways until the city is in a position to use. The City Council has referred the matter to the Finance Committee, composed from its membership. A.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

ROCHESTER, MINN.—The telephone company is planning the installation of a new switchboard and other improvements at a cost of $12,000 to $20,000.

TERRA BELLA, CAL.—The organization of the Ducor-California Hot Springs Telephone Company has been perfected and L. S. Winegrove elected president.

FRANKLIN, O.—The Home Telephone Company has been incorporated by J. L. Dodson, A. H. Washick and W. C. Pearson. The capital of the company is $2,000.

PETALUMA, CAL.—The Guglielmetti Rural Telephone Company will extend its lines into Cotati. W. D. Thomas of this place has been awarded the contract for construction work.

CANEY, OKLA.—The Oklahoma Rural Telephone Company has been incorporated with a capital of $10,000, by A. H. Utley of Caney, J. W. Craig of McAlester and Z. J. Du Pies of Colgate.

DEVILS LAKE, N. D.—The Northern Telephone Company has secured an option on the property of the Devils Lake Improvement Company, including the local telephone, light and water systems. C.

HERMISTON, ORE.—The Hermiston Telephone & Electric Company has been organized and plans for the construction of a telephone system throughout this section. An exchange will be erected at Hermiston. A.

HAMILTON, MONT.—The Mountain States Telephone & Telegraph Company will spend considerable money in repairs and new construction. The Montana Independent Telephone Company is installing new rural lines. C.

WELCH, W. VA.—The McDowell Telephone Company was recently organized, and will construct and operate telephone lines in this vicinity. The incorporators are W. P. Hawley of Bluefield, D. J. F. Strother, W. W. Hughes and James A. Henchy of Welch, and Charles F. O'Neil of Buffalo, N. Y.

TACOMA, CAL.—The Federal Court has ordered the foreclosure and sale of the Home Telephone Company, of Tacoma, to satisfy deferred interest on its outstanding bonds and a judgment of $6,637,000. The sale is to be held within six weeks; the city of Tacoma, it is said, will become a bidder for the property. A.

RED BLUFF, CAL.—The Tehama County Telephone Company has completed its new plants at Red Bluff and Corning. The company plans to extend its lines throughout the ranch district adjacent to these towns and connect with the local exchanges. Long-distance connection will be made to San Francisco and Sacramento. A.

TIFFIN, O.—The Council of this city has passed an ordinance reducing the rates of the Tiffin Consolidated Telephone Company from $1.50 and $2.00 a month for residence telephones to $1.00 and $1.50 and on business telephones from $2.50 and $3.00 to $2.00 and $2.50. The officials of the telephone company which was formed by a merger of the Central Union and Home companies in 1909 declare they will ignore the action of Council on the ground that the fixing of rates rests solely with the Public Utilities Commission. H.

TOPEKA, KANS.—A new telephone company known as the United Telephone Company, operating in North Central Kansas, capitalized at $500,000, has been granted a charter. It was approved by the Public Utilities Commission and articles of incorporation were agreed upon. The new company is a consolidation of four old companies, the Brown Telephone Company, of Abilene, the Concordia, the Solomon Valley Telephone Company, of Beloit, and the Smith & Flint Telephone Company, of Minneapolis. These companies have worked in conjunction several years. The new company will connect with all the Bell Telephone Company toll lines. The company will take over all the Bell toll lines in that part of Kansas. These companies formerly had Home Telephone Company connections.

ELECTRICAL SECURITIES.

The Boston Elevated Railway Company has filed a petition with the Railroad Commission asking its approval of the proposed issue of $5,000,000 in bonds. The issue was authorized at a recent special meeting of the Boston Elevated stockholders.

The Merchants Heat & Light Company of Indianapolis has increased its authorized capital stock from $500,000, all common, to $3,000,000, of which $1,000,000 is common and $2,000,000 preferred. Of the new stock $500,000 preferred will now be issued.

At the annual meeting of stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, Van Lear Black, first vice-president of the Fidelity Trust Company, was elected a director. Vice-President Reading Betron resigned. Otherwise only routine business was transacted.

A syndicate composed of the Commonwealth Edison, Chicago Railways, and Chicago City Railway companies will exercise option to purchase, at thirty, $20,000,000 out of $25,000,000 common stock of the Chicago Elevated Railways. The purchase carries control of elevated properties. Chicago Railways will pay $2,400,000, Commonwealth Edison $2,000,000, and Chicago City Railway $1,600,000 of the purchase price of $6,000,000. Should the syndicate exercise an option to purchase $16,000,000 preferred stock at 125, the $6,000,000 paid for common stock is to be crediated on the purchase price.

The annual meeting of the Northern Electric Railway Company was held at San Francisco, Cal., September 26. The present directors were re-elected, being E. R. Lilienthal, P. B. Lilienthal, A. E. Boynton, E. J. de Sabla, Jr., Louis Sloss and Joseph Sloss. The following officers were elected: E. R. Lilienthal, president; E. J. de Sabla, Jr., and Louis Sloss, vice-presidents; Norman Logan, secretary. The company is capitalized at $25,000,000, of which $10,000,000 is preferred stock, bearing five per cent. Organized in 1897, the company now operates 130 miles of railway, from Sacramento to Chico, by way of Oroville, and from Chico to Hamilton, Cal. It represents a consolidation of the following lines: Northern Electric, Chico Street Railway, Redding & Red Bluff Railway, Shasta Southern Railway and Marysville & Yuba City Street Railway.

DIVIDENDS.

American Light & Traction Company; quarterly preferred dividend of one and one-half per cent; quarterly common dividend of two and one-half per cent, and stock dividend on the common of two and one-half per cent, all payable November 1.

Brooklyn City Railroad Company; regular quarterly dividend of two per cent, payable October 16 to stock of record October 3.

Columbus Railway Company; regular quarterly dividend of one and one-quarter per cent on the preferred stock, payable November 1 to stock of record October 14.

Dayton Power & Lighting Company; quarterly preferred dividend of $1.50 per share, payable October 16 to stock of record September 30.

Eastern Consolidated Electric Company; a semiannual dividend of two per cent, payable November 1 to stock of record October 21.

Edison Electric Illuminating Company of Boston; regular quarterly dividend of three per cent, payable November 1 to stock of record October 16.

Pacific Telephone & Telegraph Company; quarterly preferred dividend of $1.50 per share, payable October 15.

Pennsylvania Light & Power Company; quarterly preferred dividend of one and one-quarter per cent, payable October 15.

United Electric Securities Company; annual dividend of $3.50 on preferred stock; payable November 1 to stock of record October 17.

West Penn Traction Company; the regular quarterly dividend of one-half of one per cent on the preferred stock, payable October 16 to stock of record October 7.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	Oct. 9.	Oct. 2.
Allis-Chalmers common	1¾	5¾
Allis-Chalmers preferred	11	16
Amalgamated Copper	48¾	50¾
Amer. Tel. & Cable	*78¾	*78¾
American Tel. & Tel.	133⅝	133¾
Brooklyn Rapid Transit	73¾	73½
General Electric	148	149½
Interborough-Metropolitan common	14½	14¼
Interborough-Metropolitan preferred	44½	42¼
Kings County Electric	129	129
Mackay Companies (Postal Telegraph and Cables) common	84¼	81¾
Mackay Companies (Postal Telegraph and Cables) preferred	72⅜	72⅜
Manhattan Elevated	132	132
Metropolitan Street Railway	*18	*18
New York & New Jersey Telephone	103	103
Pacific Tel. & Tel.	42¾	36¾
U. S. Steel common	58⅝	61½
U. S. Steel preferred	108½	110¼
Western Union	78¾	77
Westinghouse common	*61	62
Westinghouse preferred	115	*111½

*Last price quoted.

BOSTON.

	Oct. 9.	Oct. 2.
American Tel. and Tel.	133⅝	133¼
Edison Electric Illuminating	283	281
General Electric	148	144½
Massachusetts Electric common	19	18¾
Massachusetts Electric preferred	90½	88½
New England Telephone	145	144
Western Tel. & Tel. common	19	18¼
Western Tel. & Tel. preferred	95	95

PHILADELPHIA.

	Oct. 9.	Oct. 2.
American Railways	44	44
Electric Company of America	11⅝	11½
Electric Storage Battery common	50¾	50
Electric Storage Battery preferred	50¾	50
Philadelphia Electric	17	16⅝
Philadelphia Rapid Transit	21½	20⅞
Philadelphia Traction	83	82¾
Union Traction	49⅝	49½

CHICAGO.

	Oct. 9.	Oct. 2.
Chicago Elevated common	23	20
Chicago Elevated preferred	83	85
Chicago Railways, Series 1	88	86
Chicago Railway, Series 2	27	26½
Chicago Subway	1⅜	1¾
Chicago Telephone	119½	118
Commonwealth Edison	134½	133⅛
National Carbon common	100	101
National Carbon preferred	117	115

PERSONAL MENTION.

WILLIAM MARCONI has been elected president of the Junior Institution of Engineers, succeeding Sir J. J. Thomson.

A. D. DU BOIS, who has for the past three years been instructor in Sibley College, Cornell University, recently resigned to enter educational work in the West. Mr. Du Bois will become assistant professor of electrical engineering at Purdue University, Lafayette, Ind.

THOMAS A. EDISON, with Mrs. Edison, his son Theodore, and daughter Madeline, returned from Europe on the *Amerika*, October 7. Mr. Edison spoke enthusiastically of his trip and of conditions abroad, but stated that he was glad to be in this country again after his two months' stay abroad.

CYRUS O. BAKER, the platinum importer and refiner, and Mrs. Baker, returned last week from a five months' tour of England, France and Germany. Mr. Baker took the baths of Bad Wilgunden, and comes back with renewed strength to take up the problems of the platinum industry.

E. O. SESSIONS of the engineering firm of Woodmansee, Davidson & Sessions, Inc., Chicago, has just returned from a three-weeks' trip to the Pacific Coast, where he has been investigating high-tension work. The above firm has been working for several months endeavoring to ascertain the aging and fatiguing of porcelain.

MASON B. STARRING, president of the Chicago & Oak Park Elevated Railroad Company, is said to have been elected president of the United Railways Investment Company of New York. The latter concern controls the street railways of Pittsburgh, Pa., and San Francisco, and a number of other public utilities corporations in the state of California.

CALVERT TOWNLEY has been elected president of the Lackawanna & Wyoming Valley Rapid Transit Company, Scranton, Pa., and its subsidiary companies to succeed George C. Smith, who is leaving the Westinghouse interests to devote his entire time to his own affairs. Mr. Townley, as assistant to the president of the Westinghouse Electric & Manufacturing Company, represents directly the control by that company of the Lackawanna & Wyoming Valley Rapid Transit.

ROBERT EDWARDS, JR., recently acquired the control of Edwards & Company, of New York. Mr. Edwards has been active in the electrical field ever since his business career began, having identified himself first with Edwards & Company, and then with the Electric Supply Company, of Chicago. Returning to New York later he became sales manager of Edwards & Company and directed its sales for eight years. A bigger field became open to him in 1910, when he was chosen to direct the supply sales department of the Northern Electric Supply & Manufacturing Company throughout the Dominion of Canada. On October 1, 1911, he assumed his present position. Mr. Edwards was well known as a member of the militia of New York State and has always taken great interest in that direction.

OBITUARY.

PAUL HOENACK, known as one of the most expert telegraph mechanicians in this country, died recently at his home in New York City, of heart failure. Mr. Hoenack was born in Germany in 1840, and worked at the Siemens-Halske works there and with Elliot Brothers in England. Coming to America in 1865 he entered the service of the Western Union Telegraph Company under the personal supervision of Mr. Phelps, inventor of the Phelps "combination" printing instrument. In 1878 Mr. Hoenack established a small shop of his own and did considerable work on the McDonough telephone and various experimental modifications for demonstration before the courts in the protracted litigation with the Bell Company. His work covered the entire field of cable, synchronous, multiplex, stock quotation, printing and rapid automatic telegraphy.

LEGAL NOTE.

RISKS ASSUMED BY MEN IN CONSTRUCTION WORK.—A lineman engaged with other men in the construction of a line of poles and wires for the conveyance of electric power was injured by the falling of a pole which had not been properly set. The Court of Appeals of New York applies to the case the rule that the duty of the master to exercise reasonable care to provide a fairly safe working place for his servants does not apply where the prosecution of the work itself makes the place and creates the danger. It says that if the work of setting poles was a part of the construction of this electric line, it followed that it was part of the very work which created the place in which this lineman was called upon to work. The negligence of the pole setters was, in this case, the negligence of his fellow servants in a detail of the work in pursuit of the common purpose in which all were engaged, though if this had been a completed line, upon which he had been employed to string additional wires, the rule might be different. The doctrine of fellow servants was applicable although the force of men engaged in the construction of this line was divided into gangs, each of which performed different parts of the work, as groundmen, framers, pole-setters, and linemen, all being subject to the control of the same superintendent and foreman, both of whom gave orders and hired and discharged men.—Mullin vs. Genesee County Electric Light, Power & Gas Company, 95 N. E. R. 689.

PROPOSALS.

GENERATING MACHINERY.—The office of the Supervising Architect will receive sealed bids until October 25 for one gas engine and electric generator, etc., in the United States Post Office at London, Ky., in accordance with the specification, copies of which may be had at the Supervising Architect's office.

WIRING.—Proposals will be received until November 7, for the construction complete, including plumbing, gas piping, heating apparatus, electric conduits and wiring, and interior lighting fixtures of the Post Office at Jonesboro, Ark. Drawings and specifications may be obtained from the custodian of site at Jonesboro, Ark., or at the Supervising Architect's office.

ELECTRICAL SUPPLIES.—The Quartermaster of the Military Prisons, Fort Leavenworth, Kans., will receive sealed bids until October 25, for furnishing the following: 950 feet lead-sheath cable, 500,000 circular mils, 450 feet of lead-sheath cable, 250,000 circular mils, two circuit-breakers, six inclosed fuses, thirty wall insulator hangers, 100 porcelain insulators, thirty clamp switches, three knife switches, twelve wrought-copper terminals and one recording wattmeter.

WIRING.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until October 25 for the construction of a one-story and basement, non-fireproof, brick-and-stone-faced building of approximately 4,200 square feet area (including plumbing, gas piping, heating apparatus, electric conduits and wiring and lighting fixtures), for the United States Post Office at Lexington, Va., in accordance with drawings and specification, copies of which may be obtained from the custodian of site at Lexington or at the Supervising Architect's office.

NEW PUBLICATIONS.

ELEKTROMOTOR.—A monthly publication with this title has been started by Ulrich Meyer in Stuttgart, Germany. It is devoted to furthering the use of electricity in the house, the factory and on the farm.

UNDERWRITERS' LIST.—The National Board of Fire Underwriters has published a list of gas, oil and chemical appliances which have been approved. In addition electrically heated brooders and incubators are listed.

LEVANT TRADE REVIEW.—This magazine, of which the first number only recently appeared, is to be published quarterly from the offices in Constantinople, Turkey, and deals with trade conditions throughout the far East. As the publication is prepared by the American Chamber of Commerce for Turkey, it deals first of all with the conditions as regards American trade. A number of special articles appear in the first issue and the publication promises to be an interesting one to those concerned with eastern trade.

UNDERWRITERS' RULES.—The 1911 edition of the "National Electrical Code," embodying the rules and requirements of the National Board of Fire Underwriters for electric wiring and apparatus, as recommended by the National Fire Protection Association, has recently been published. Seven electrical, insurance and building societies were represented on the Electrical Committee of the National Fire Protection Association which had the matter in charge, so that the rules compiled are complete from every point of view.

SMALL MOTORS.—Under this name a small monthly publication has been started by the Westinghouse Electric & Manufacturing Company, with the object of creating a closer bond between the manufacturer and dealer in small electric motors for general household, store and office work. The publication will be devoted to practical applications of small motors, showing views of motors in actual service, such as operating ice-cream freezers, small lathes, washing machines, grinding wheels, and numerous other household devices. Short practical articles will appear, incorporating advice as to the installation, operation and care of the motors.

SWITCHBOARD INSTRUMENTS.—The Bureau of Standards, Washington, D. C., is issuing a technical paper entitled "A Comparison of American Direct-Current Switchboard Voltmeters and Ammeters," by T. T. Fitch and C. J. Huber. This paper is an analysis of the various factors of performance and details of construction of direct-current switchboard voltmeters and ammeters. All American makers of standard sizes of such instruments were given an opportunity to submit samples. The voltmeters all showed maximum errors of calibration less than one per cent of full scale reading, while the ammeters showed maximum errors of from two to six per cent. The ammeters are more subject to errors than are voltmeters owing to the necessity of working them on the low electromotive force permissible at the terminals of the shunts. The details of performance and the constants of construction are tabulated. The general lines of design are very similar in all the instruments, which may be taken as typical not only of American, but also of European direct-current practice. The most decided departure from type is in the use of the single air gap in the instruments of one maker. Further improvements in direct-current switchboard instruments are to be looked for mainly in the refinement of details of design and construction.

INDUSTRIAL ITEMS.

THE LIPPINCOTT GLASS COMPANY announces that on and after September 15 its offices will be located at 102 East Third Street, Cincinnati, O. All communications to the company should be sent to the new address.

THE HUGHES ELECTRIC HEATING COMPANY, Chicago, Ill., has established branch offices in San Francisco and Seattle. Mr. Hughes reports a large number of new orders, one central station having requested a shipment of 100 stoves.

THE ELECTRIC SERVICE SUPPLIES COMPANY, Philadelphia, Pa., designates the October issue of the *Keystone Traveller* as its convention number. A number of the company's specialties are illustrated and described in the publication.

THE SHELBY ELECTRIC COMPANY, Shelby, Ohio, has issued an illustrated booklet entitled, "The Fortress of Lamp Quality." It describes in an attractive and instructive fashion, the development and engineering facilities enjoyed by the manufacturers of Shelby lamps.

THE WAGNER ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., announces the appointment of P. L. Lewis as sales representative in Texas. Mr. Lewis, who will make his headquarters in Dallas with an office in the Scollard Building, takes the place of J. A. Gelzer who severed his connection with the company several months ago.

THE UNITED STATES ELECTRIC COMPANY, New York, N. Y., reports that the Atlantic Coast Line Railroad which has had for some time 167 Gill selectors in service in five circuits on its telephone train-dispatching and message service, has now purchased ninety-eight additional Gill-selector equipments which are being installed in extension of the system to Jacksonville, Fla.

THE CUTTER COMPANY, Philadelphia, Pa., has prepared a wall calendar for the coming year. On each page of the calendar is reproduced a photograph of one of the types of Cutter circuit-breaker with a short description of its features and a statement of the capacities in which the breaker is made. The calendar is attractively prepared and of sufficient size to be easily read.

THE WARREN ELECTRIC & SPECIALTY COMPANY, has prepared a vest-pocket compendium of commercial information on Peerless lamps, giving ratings, voltage ranges, prices and discounts, with a small illustration of each type listed. This "short catalog" is being distributed mainly through the electrical supply houses handling Peerless lamps, but copies can be obtained direct from the manufacturers at Warren, O.

THE HARRISON SAFETY BOILER WORKS, Philadelphia, Pa., has in its Engineering Leaflet No. 10 brought together the most recent engineering data, figures, tables, etc., on modern steam-piping practice, including the use of high-steam pressures, removal of moisture from steam, utilization of exhaust steam for absorption ice machines, low-pressure turbines, etc. Detailed information as to the installation of Cochrane steam and oil separators is included.

THE STERLING ELECTRICAL MANUFACTURING COMPANY, of Warren, O., in its new loose-leaf catalog lists describes not only the more common types of incandescent lamps, but also the spiral carbon-filament type, and the Sterling single-unit fixtures and Mazdafore clusters for industrial lighting. The size of page is 6 by 9 inches, punched for binding. Future issues of sheets will be made whenever changes in lamp data may make it advisable.

THE TRIUMPH ELECTRIC COMPANY, of Cincinnati, O., reports a rapidly increasing export business. A carload of equipment, including several large generators and motors, was quite recently shipped to Pekin, China. Inquiries and orders have also been received from India, Cuba and New Zealand. The company reports a large volume of business during the past six months, the sales aggregating more than fifty per cent above the average for the past ten years.

THE LINDSLEY BROTHERS COMPANY, Spokane, Wash., pioneers in the western cedar pole industry, have found it necessary to open a Canadian office at Calgary, Alta. G. U. Bacon has been placed in charge of the new office as resident manager and will push the company's well-known "Pole-cat Brand" of cedar poles throughout Canada. The company is also adding to its line the "Bear Brand" of cedar posts. This company's cedar-pole yards are located at many points in Idaho, Montana, British Columbia and Washington. Its main yards in British Columbia are at Nakusp on Arrow Lake.

THE HASKINS GLASS COMPANY, Wheeling, W. Va., tells an interesting story, in a recent bulletin, of the development of Haskins-Lucida glass. An imperfect glass of a type highly desirable for use in manufacturing shades and reflectors was found to be manufactured by crude processes in Europe. The glass was studied, the process refined, and the present Haskins product is the result. The glass is translucent, has an artistic appearance, and may be made up in the desired forms either by blowing or molding. A number of illustrations and distribution curves of the reflectors are included in the publication.

THE AMERICAN SHIP WINDLASS COMPANY, Providence, R. I., has issued a new catalog of the Taylor stoker. The stoker is well illustrated with the parts named in several views. Other illustrations show Taylor stokers as installed in well-known power plants such as the New York Edison Waterside Station, the Christian Street Station of the Philadelphia Electric Company, the Detroit Edison Company, the Everett Mills of Lawrence, and the Oxford Paper Company, of Rumford Falls, Maine. An interesting picture is shown of the largest stokers ever built, these being the two fourteen-retort stokers made for the Hartford Electric Light Company.

THE LORD MANUFACTURING COMPANY, of New York, has acquired all title and interest, rights, etc., formerly owned by the Spencer Air Purifying Company, and has purchased outright the Spencer Company. The Lord Company has acquired all of the tools, dies, machinery, shop appliances and factory, and will hereafter manufacture and sell the Spencer air purifier, Spencer air equalizer, and all other appliances covered by patents and patents pending. These devices have been in service on electric railways and in mines for several years, and have proven to be highly satisfactory. The Lord Manufacturing Company will immediately prepare literature fully describing them.

THE DUNCAN ELECTRIC MANUFACTURING COMPANY, Lafayette, Ind., reports that business is excellent, and evidences of this prosperity were quite apparent to a representative of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN who recently visited the company's plant. The demand for the product of the Duncan Company, which consists solely of meters and transformers, has been so great that for some time past the company has been obliged to work day and night. The Duncan products have met with favor right from the start and their popularity seems to increase month after month. The surprisingly large volume of business transacted by the company is no doubt due to the excellence of its product as well as the able management of Thomas Duncan, vice-president, who is without doubt, one of the oldest and best informed men in his line.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, Pittsburgh, Pa., was awarded a contract by the Commission Government of the City of Tacoma, Wash., for the entire switchboard and auxiliary apparatus for the power house, substation and transmission line of the 27,000-horsepower hydroelectric plant the city is erecting. The plant is located about seven miles from the city of Tacoma on the Nisqually River, and electrical energy will be transmitted at 55,000 volts for furnishing light, power and railways in the city and vicinity. The substation will be built in Tacoma for lowering the voltage and distributing the energy. The switchboard will be built of blue Vermont marble and will consist of fourteen panels for the main board and five panels for the substation board. An idea of the size of the board may be gained from the fact that six tons of copper alone will be used in its construction. The amount involved in the contract, which also includes a large amount of details and supplies, is in the neighborhood of $85,000.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has issued a number of publications taking up various types of machinery and apparatus. Bulletin No. 4857 describes its switchboard and high-tension relays. Among these relays are those for circuit-opening, time-limit relays, inverse time-limit, definite time-limit, low voltage, no-voltage and over-load, reverse current, reverse phase, etc. Each type of relay is illustrated and described, and the publication contains general notes on the use of relays, including a diagram of modern power house wiring and busses, and the location of relays. Bulletin No. 4859 describes the company's line of synchronous condensers especially adapted for floating on the line for improving the power factor. These condensers have been designed to meet the demand for a comparatively inexpensive high-speed machine of this nature. Bulletin No. 4871, on mercury-arc rectifiers for battery charging supersedes the company's previous bulletin on that subject. Bulletin 4873 has for its subject a description of the company's control apparatus for steel mills. The bulletin describes for this service automatic compensators, contactors, master-controllers, rheostatic controllers, etc., and will be found interesting to all connected with the operation of steel mills. Bulletin No. 4877 is devoted to direct-current switchboard panels, single polarity, for small mining plants. These panels have been designed to meet a large demand for switchboards that are comparatively inexpensive, and yet contain an equipment comprising the essentials requisite for safe and satisfactory operation of the plant. They are for use only in stations with a grounded negative. Connection and dimension diagrams are included in the bulletin. Bulletin No. 4882 describes the inclosed flame-arm lamp utilizing the impregnated or flame carbon electrodes which gives remarkable illuminating efficiency, and this, together with the simplicity of the lamp mechanism, renders it ideal for the economical illumination of large areas. The lamp is so designed as to admit of the use of any of the standard makes of flame carbons available. This line of lamp comprises designs suitable for all classes of commercial service

DATES AHEAD.

American Physical Society. Next regular meeting, New York City, October 14.

Denver Electric Show. Denver, Colo., October 14-21.

Order of the Rejuvenated Sons of Jove. Annual convention, Denver, Colo., October 16-18.

American Mining Congress. Fourteenth annual meeting, Chicago, Ill., October 24-28.

Illinois State Electric Association. Annual convention, Rockford, Ill., October 24, 25 and 26.

Telephone Pioneers of America. Boston, Mass., November 2-4.

Association of Railway Electrical Engineers. Annual convention, La Salle Hotel, Chicago, November 6-10.

Alabama Light and Traction Association. Montgomery, Ala., November 14 and 15.

Ohio Society of Mechanical, Electrical and Steam Engineers, Canton, O., November 17 and 18.

Association of Railway Telegraph Superintendents. Joint meeting of eastern and western divisions, Chicago, Ill., November 23 and 24.

Los Angeles Electrical Exposition. Los Angeles, Cal., November 25-December 9.

American Institute of Chemical Engineers. Annual meeting, Washington, D. C., December 20-22.

National Electric Light Association. Next annual convention, Seattle, Wash., June 10-14, 1912.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26, 1912.

Directory of Electrical and Allied Engineering and Scientific Societies

(Published in the second issue of each month.)

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ILLINOIS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. M. Camp, Henry, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, H. E. Chubbuck, Mayer Building, Peoria, Ill.

ILLUMINATING CLUB OF ST. PAUL. Secretary, Clovis M. Converse, 303 North Snelling Avenue, St. Paul, Minn.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Preston S. Millar, Engineering Societies Building, 29 West Thirty-ninth Street, New York, N. Y.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, L. H. Woods, 2355 Jerome Avenue, New York, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF MISSISSIPPI. Secretary and treasurer, J. B. Shannon, New Albany, Miss.

INDEPENDENT TELEPHONE ASSOCIATION OF TEXAS AND LOUISIANA. Secretary, C. A. Shock, Sherman, Tex.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, J. V. Zartman, Indianapolis, Ind.

INDIANA ENGINEERING SOCIETY. Secretary, Chas. Brassmann, 43 Union Trust Building, Indianapolis, Ind.

INDIANA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Walter J. Uhl, Logansport, Ind.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Clarence R. George, Houston, Tex.

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IOWA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. J. Thill, Des Moines, Iowa.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Iowa.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary, James D. Nicholson, Newton, Kans.

KENTUCKY INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. G. Turpin, Henderson, Ky.

MAINE ELECTRICAL ASSOCIATION. Secretary, F. D. Gordon, Lewiston, Me.

MAINE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, M. E. Crow, Houlton, Me.

MASSACHUSETTS ELECTRIC LIGHTING ASSOCIATION. Secretary, M. L. Fahey, 84 State Street, Boston, Mass.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby Street, Boston, Mass.

MASTER CAR BUILDERS' ASSOCIATION. Secretary, J. W. Taylor, 390 Old Colony Building, Chicago, Ill.

MICHIGAN ELECTRIC ASSOCIATION. Secretary and treasurer, Herbert Silvester, Detroit, Mich.

MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. A. Burch, Battle Creek, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, E. T. Street, Northern Heating & Electric Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Secretary, A. H. Jones, McComb, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary, N. J. Cunningham, Springfield, Mo.

MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, George W. Schwerer, Windsor, Mo.

MUNICIPAL LIGHTING ASSOCIATION OF MASSACHUSETTS. Secretary, J. C. Norcross, Reading, Mass.

NATIONAL ACADEMY OF SCIENCES. Secretary, Arnold Hague, United States Geological Survey, Washington, D. C.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF COTTON MANUFACTURERS. Secretary, C. J. H. Woodbury, Boston, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, O.

NATIONAL ELECTRIC CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, T. C. Martin, 33 West Thirty-ninth Street, New York, N. Y.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, N. H. Morton, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL INSPECTORS' ASSOCIATION. Secretary, T. H. Day, 27 Pine Street, Hartford, Conn.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary, Franklin H. Wentworth, 87 Milk Street, Boston, Mass.

NATIONAL GAS AND GASOLINE ENGINE TRADES ASSOCIATION. Secretary, Albert Stritmatter, Cincinnati, O.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. B. Ware, McCormick Building, Chicago, Ill.

NATIONAL ISOLATED PLANT ASSOCIATION. Secretary, E. D. Fieux, Wing Manufacturing Company, New York City.

NEBRASKA ASSOCIATION OF INDEPENDENT TELEPHONE COMPANIES. Secretary, Charles H. Hood, Lincoln, Neb.

NEBRASKA ELECTRICAL ASSOCIATION. Secretary, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Alton F. Tupper, 84 State Street, Boston, Mass.

NEW ENGLAND SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl Street, Boston, Mass.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth Street, New York, N. Y.

NEW YORK RAILROAD CLUB. Secretary, H. D. Vote, 95 Liberty Street, New York, N. Y.

NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. Max Eaton, Niagara Falls, N. Y.

NORTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary and treasurer, L. C. Kane, Kensal, N. D.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, O.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Ralph Reamer, Columbus, O.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

OKLAHOMA ELECTRIC LIGHT, RAILWAY AND GAS ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, Frank J. Sherrer, 195 Broadway, New York, N. Y.

ORDER OF THE REJUVENATED SONS OF JOVE. Mercury, Roy M. Van Vliet, Monadnock Block, Cnicago, Ill.

PACIFIC COAST ELECTRIC VEHICLE ASSOCIATION. Secretary, A. H. Halloran, 901 Atlas Building, San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, Walter E. Long, Philadelphia Electric Company, Philadelphia, Pa.

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. E. Bradley, 135 South Second Street, Philadelphia, Pa.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.

PHILADELPHIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. G. Sellers, Philadelphia, Pa.

PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Colo.

PITTSBURGH ELECTRIC BOOSTERS' CLUB. Recording Wattmeter, O. R. Rombach, 919 Liberty Avenue, Pittsburgh, Pa.

RAILWAY ELECTRIC SUPPLY MANUFACTURERS' ASSOCIATION. Secretary, J. Scribner, General Electric Company, Chicago, Ill.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa.

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SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS. Secretary, David H. Bates, 658 Broadway, New York, N. Y.

SOCIETY OF AUTOMOBILE ENGINEERS. Secretary, Alexander Churchward, 30 Church Street, New York, N. Y.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, E. D. Forbes, 96 Franklin Street, South Framingham, Mass.

SOUTH DAKOTA ENGINEERING SOCIETY. Secrtary, R. D. Gulbertson, Mitchell, S. D.

SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. R. Buck, Hudson, S. D.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, D. G. Fisher, Dallas, Tex.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK. Secretary, J. H. Pardee, J. G. White & Company, New York, N. Y.

TELEPHONE SOCIETY OF NEW YORK. Secretary, T. H. Lawrence, Eighteenth Street and Irving Place, New York, N. Y.

TEXAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Leon Spencer, Gainesville, Tex.

UNDERWRITERS' NATIONAL ELECTRICAL ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 141 Milk Street, Boston, Mass.

WESTERN SOCIETY OF ENGINEERS. Secretary, J. H. Warder, Monadnock Block, Chicago, Ill.
WIRELESS INSTITUTE. Secretary, Alfred N. Goldsmith, College of the City of New York.
WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, Milwaukee Electric Railway & Light Company, Milwaukee, Wis.
WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.
WISCONSIN STATE TELEPHONE ASSOCIATION. Secretary, Paul J. Weirich, Monroe, Wis.
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VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsburg, Vt.
VERMONT ELECTRICAL ASSOCIATION. Secretary, A. B. Marsden, Manchester, Vt.
WASHINGTON SOCIETY OF ENGINEERS. John C. Hoyt, 1330 F Street, Washington, D. C.
WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe Street, Chicago, Ill.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) October 3, 1911.

1,004,557. RESISTANCE FURNACE. William D. Coolidge, Schenectady, N. Y., assignor to General Electric Co. Filed Dec. 3, 1907. Has a resistance tube consisting of tungsten mixed with thoria. About the tube is a refractory packing protecting it from carbon vapors and through this packing an inert gas is passed.

1,004,566. SELECTIVE SIGNALING DEVICE. Edwin R. Gill, Yonkers, N. Y., assignor to Howard E. Merrell, New York, N. Y., and Orlo J. Hamlin, Smethport, Pa. Filed Sept. 4, 1908. Comprises a toothed wheel, a circuit-controlling element moved thereby and an impelling pawl for the wheel, a second circuit-controlling element on an arm on a shaft, side bars pivoted on the arm, an inertia wheel mounted between the bars, an inclined track whereon said wheel is adapted to roll, and means operating simultaneously with the impelling pawl for the toothed wheel for controlling the movements of the inertia wheel.

1,004,567. SELECTIVE SIGNALING SYSTEM. Edwin R. Gill, Yonkers, N. Y., assignor to Howard E. Merrell, New York, N. Y., and Orlo J. Hamlin, Smethport, Pa. Filed March 28, 1910. Includes telephones bridged across a metallic line circuit and also telephones connected between ground and neutral points on the metallic circuit. Selective signaling may be carried on for either set of telephones while the other is used for talking.

1,004,571. PORTABLE SMOOTHING IRON. Alice Emma Hollingshead, Minneapolis, Minn. Filed Dec. 5, 1910. Is arranged similarly to a soldering iron, but has a large oval head containing the electric heating element.

1,004,585. ILLUMINATED SIGN. Hugh Mulholland, New York, N. Y., and Charles G. West, Greenwich, Conn., assignors to Multicolor Electric Sign Co., New York, N. Y. Filed Aug. 15, 1910. Has an apertured wall, a bulb closing the aperture therein, a transparent color-disk extending across the bulb, and a transparent retainer for the disk.

1,004,594. STOP-MOTION. Michael C. Ryan, Phoenix, N. Y. Filed Feb. 16, 1910. Includes a vertically movable tension and detector arm having a thread eye and an electric-contact and stop end, and a stationary electric-contact stop adapted to be electrically engaged by the end when the detector drops from normal position.

1,004,599. ARMATURE FOR ELECTRIC GENERATORS. John Splitdorf, New York, N. Y., assignor to C. F. Splitdorf, New York, N. Y. Filed June 14, 1910. An armature for a magneto is provided with non-magnetic plates adjacent the heads at opposite ends, the plates having outwardly extending portions spaced apart, and windings within these spaces.

1,004,608. ELECTRIC WATER-HEATING APPARATUS. Johann G. Wallmann, Oakland, Cal. Filed Aug. 25, 1910. Consists of a boiler with a number of electrodes having lower integral concave surfaces spaced therein, and current-conducting means leading to the electrodes.

1,004,618. TROLLEY-HEAD. Joseph J. Bennett, Pittsfield, Mass. Filed Jan. 21, 1911. The harp is flexibly mounted on the trolley pole.

1,004,643. MECHANISM FOR MAKING ARMORED CABLE AND SIMILAR PRODUCTS. Henry R. Gilson, Fair Oaks, Pa., assignor to National Metal Molding Co., Pittsburgh, Pa. Filed May 12, 1910. The machine includes a tapering mandrel having on its surface a helical groove, a coiling member for laying a strip in engagement therewith, means for moving the coiling member around the mandrel, and means for rotating the mandrel in the opposite direction.

1,004,644. ARMORING CABLE. Henry R. Gilson, Fair Oaks, Pa., assignor to National Metal Molding Co., Pittsburgh, Pa. Filed May 12, 1910. The method of armoring cable consists in coiling about and continuously drawing down into binding engagement with the surface of the cable a spirally wound metallic armor, and thereby feeding the coils and cable continuously forward.

1,004,648. PORTABLE TOTAL-CURRENT-REGISTERING MECHANISM. Frank Hedley, Yonkers, and James S. Doyle, New York, N. Y. Filed Jan. 5, 1911. A total current-time registering device for railway-car motors includes registering time-period dials and pointers and a clockwork mechanism for operating the same, a stop device for the clock mechanism, a magnet for controlling the device, and a supporting contact device connected to the terminals of the magnet.

1,004,657. REFILLABLE FUSE. Frank H. Kaiser and John G. Clemens, Buffalo, N. Y. Filed March 8, 1911. An inclosed fuse in which the fuse wire can be replaced between the terminal sockets.

1,004,669. VOTING MACHINE. Sidney L. McLaurin, Brandon, Miss. Filed Feb. 20, 1911. A yea and nay voting system, has two buttons on each member's desk, connected to electrical indicating devices on the secretary's desk.

1,004,671. COLOR-CHANGING AND FLASH-LIGHT SIGN. Gustave A. Miller, Wichita, Kans. Filed Sept. 6, 1910. An electric motor drives an endless color-changing curtain between a set of incandescent lamps and the sign letters; it also drives a rotary reflector for flashing the light through the curtain.

1,004,673. PROCESS OF AND APPARATUS FOR MAKING CLAD METALS. John F. Monnot, New York, N. Y., assignor to Duplex Metals Co., New York, N. Y. Filed Dec. 23, 1908. Copper-clad steel wire is made by passing the steel wire through a bath of fused electrolyte containing copper which is maintained above the melting point of copper and passing an electric current between the wire as a cathode and the bath as anode.

1,004,675. CONTROLLER-OPERATED GONG FOR ELECTRIC CARS. John E. E. Nash, Denver, Colo. Filed April 29, 1910. Turning of the controller handle to starting position actuates the gong.

1,004,681. LIGHTNING-ROD CABLE. Edward Henry Parker, New York, N. Y. Filed Dec. 23, 1910. Is composed of wires of a good conducting material braided together to form strands spongy in texture, the strands so formed being twisted together to form a flexible cable of substantially uniform diameter.

1,004,685. INSULATING SPACER. Laurence P. Dickey, Philadelphia, Pa. Filed Nov. 30, 1909. A lighting fixture comprises a stud, bracket and insulating coupler, in combination with a canopy and an insulating spacer, arranged to engage the stud and having extensions forming a seat for the canopy, the spacer being capable of distortion to adjust the seat.

1,004,740. ELECTRIC ALARM. Peabody A. Brown, Denver, Colo. Filed Sept. 22, 1908. Combined with a normally closed main circuit having call boxes located therein is a magazine containing cartridges, a spark coil, a number of spark-coil circuits in which the cartridges are respectively located, and a connection between the call-box circuit and the spark-coil circuits, whereby as the call-box circuit is broken one of the spark-coil circuits is closed.

1,004,748. WAVE-DETECTOR. John L. Creveling, New York, N. Y. Filed May 24, 1907. Comprises an electrode, an electrode holder, a movable sleeve surrounding the same, means for retaining the sleeve in fixed positions upon the holder, an electrolyte and means for supporting the electrode in adjustable relation to the electrolyte in such manner that it may be immersed therein.

1,004,767. COMBINED TELEGRAPH, SIGNAL, AND TELEPHONE SYSTEM. William A. Froeckman, St. Louis, Mo., assignor of one-half to Peter P. Finnegan, St. Louis, Mo. Filed May 5, 1910. A fire-alarm system comprising a central exchange, a number of substations or engine-houses, the exchange and substations being each provided with a telegraph instrument, a signaling instrument and a telephone instrument, a number of separate metallic circuits connecting the exchange instruments with the substation instruments by multiple connection, and means for utilizing any one of the circuits for operating any one of the instruments.

1,004,780. ELECTRIC CONTROLLER. Jay H. Hall, Cleveland, Ohio, assignor to Electric Controller & Manufacturing Co., Cleveland, O. Filed July 27, 1911. A control system for two motors whose armatures are conected in parallel, has two sets of switches for reversing the current in the armatures, one set of the switches connecting the fields of both motors in the circuit of one armature and the other set connecting the fields in the circuit of the other armature.

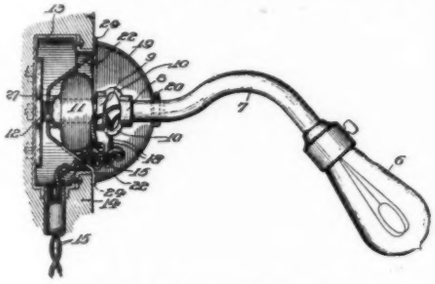
1,004,785. TROLLEY ATTACHMENT. John Phillips Henderson, Sharon, Pa. Filed Nov. 29, 1909. Combined with a spindle mounted on runners and having a limited vertical movement are means mounted on the spindle for winding a trolley rope, and secondary means mounted on the spindle and normally opposing the first named means.

1,004,790. ELECTRICALLY CONTROLLED TRAIN-STOPPING MECHANISM. Charles J. Hurley, Sharon Hill, Pa. Filed Aug. 20, 1910. An electromagnet in the track circuit operates a plunger so as to actuate the air-brake valve.

1,004,793. MANUFACTURE OF ELECTRODES FOR SECONDARY BATTERIES OR STORAGE CELLS. Victor de Karavodine, Billancourt, France, assignor of one-half to Serge Berditschewsky Apostoloff, London, England. Filed Oct. 5, 1910. Consists in making a paste of lead sulphate, water and ammonia, forming this paste to the desired shape and converting it to spongy lead by electrolysis in a solution of ammonium sulphate maintained alkaline by ammonia.

1,004,795. ELECTRIC WELDING. Laurence S. Lachman, New York, N. Y., assignor to Universal Electric Welding Co., New York, N. Y. Filed Oct. 14, 1908. This method of uniting a pin or rod to a plate consists in forming a countersink in the end of the pin and one or more projections extending beyond the outer wall of the countersink and uniting the pin to the plate by an electric butt-welding operation.

1,004,806. SAFETY DEVICE FOR RAILWAYS. Charles B. Mitchell, Franklin, Tex. Filed May 9, 1910. Mechanical stop devices at the ends of block sections are controlled by electromagnets whose circuits are actuated by the passage of trains.



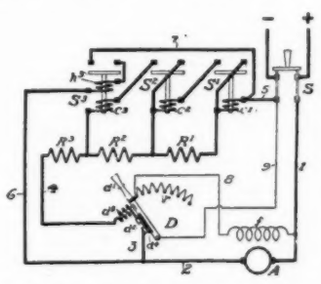
1,004,685.—INSULATING SPACER FOR BRACKET FIXTURES.

1,004,807. ILLUMINATED SIGN. Lionel H. Moise, San Francisco, Cal. Filed Mar. 22, 1909. A channel-form sign letter has perpendicular edges on one side and edges making an obtuse angle on the other side, with incandescent lamps at the base of the channel.

1,004,808. ILLUMINATED SIGN. Lionel H. Moise, San Francisco, Cal. Filed Feb. 9, 1910. A skeleton letter for a sign consists of a letter body painted on the main surface of the sign and a separate front plate parallel thereto and secured to it at a number of corners. Between the back and front plates are incandescent lamps that throw much of their light through lenses in the front plate.

1,004,811. TROLLEY FROG AND CROSSING. Ralph E. Noble and Louis E. Mitchell, Chicago, Ill., assignors to Morgan-Gardner Electric Co., Chicago, Ill. Filed June 11, 1909. Consists of a plate with a guide rib having its lower edge tapered or widened toward the plate so that the line of contact with the trolley wheel in passing thereunder is gradually changed from the bottom of the groove of the wheel to the outer edges of the flanges thereof.

1,004,825. ELECTRIC CONTROLLER. Harry F. Stratton, Cleveland, Ohio, assignor to Electric Controller & Manufacturing Co., Cleveland, O. Filed Apr. 6, 1911. An automatic motor starter combined with a speed regulator consists of a number of electromagnetic switches governing the resistance in series with the armature (the last one of them establishing a direct path to the armature) and a hand-controlled field rheostat which must have its contact arm in the position where all field resistance is cut out in order to form a closed path for the armature circuit in starting.



1,004,825.—MOTOR CONTROLLER.

1,004,826. SYSTEM OF ELECTRICAL DISTRIBUTION. Alfred Mills Taylor, Birmingham, England. Filed Jan. 23, 1906. A system for automatically controlling the charge of storage batteries includes a motor for regulating the charging rheostat and a number of automatic switches for governing the operations.

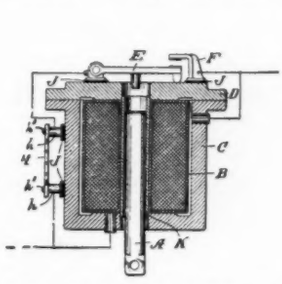
1,004,846. ELECTRICALLY OPERATED ANNUNCIATOR. Francis W. Bost and Boyd Gobel, China Grove, N. C. Filed Oct. 19, 1909. A sliding member is allowed to drop when a catch is pulled out of place by an electromagnet.

1,004,860. SOLENOID WITH SHUNT. Arthur C. Eastwood, Cleveland, O., assignor to Electric Controller & Manufacturing Co., Cleveland, O. Filed June 7, 1910. A solenoid connected in shunt to the motor circuit operates a make-and-break contact in series with the motor. When the coil is energized the motor circuit is closed, and upon deenergization the circuit opens. A brake works in conjunction with the switch; being inoperative when the solenoid is energized.

1,004,879. SIGNALING SYSTEM FOR MINES. Edgar M. Johnson, Hancock, Mich., assignor of one-half to Ross D. Blackburn, Hancock, Mich. Filed Sept. 9, 1907. Each of the station boxes, at different levels, has a magnet and a target which is operated by the magnet, and is visible through a hole in the box. Each box also has a signaling switch for controlling the flow of current, and an operating handle mounted on the box.

1,004,884. CURRENT COLLECTOR FOR ELECTRICALLY PROPELLED VEHICLES. Willy Kohler, Bremen, Germany. Filed Mar. 17, 1910. The collector runs on two wires; a frame carrying the contact wheels so that they run along one wire and are pressed into close contact by a spring device engaging the other wire.

1,004,911. BALING PRESS. George E. Rouse, Marley, Ill. Filed Sept. 25, 1909. Comprises a plurality of contact arms electrically connected with each pole of a current source and arranged in pairs. A rotatable spur wheel is carried on the extremity of each contact arm and a contact plate carried on each division block is adapted to wipe over and close the circuit through the spur wheels and contact arms, distinctly and successively operating the annunciator.



1,004,860.—SOLENOID SWITCH.

1,004,923. METHOD OF HEATING CARBON. William Acheson Smith, Niagara Falls, N. Y., assignor to International Acheson Graphite Co., Niagara Falls, N. Y. Filed Dec. 20, 1910. A commercial uniform product is obtained by passing an electric current between terminals embedded in a body of carbon or carbonaceous material supported by fixed refractory walls, and advancing the body in a direction substantially parallel to the lines of current flow. Volatile constituents are thereby expelled.

1,004,924. ELECTRIC RESISTANCE FURNACE. William Acheson Smith, Niagara Falls, N. Y., assignor to International Acheson Graphite Co., Niagara Falls, N. Y. Filed Dec. 20, 1910. Renewed Aug. 12, 1911. Relates to the construction of the furnace used with the process described in the foregoing patent.

1,004,943. ELECTRIC PUMP GOVERNOR. Walter V. Turner, Edgewood, Pa., assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Filed Oct. 30, 1908. Comprises a controlling device and a piston for actuating this, a main valve mechanism for controlling the supply of fluid under pressure to the actuating piston, and valve means operated by the movement of the actuating piston for varying the pressure on one side of the valve mechanism to facilitate its movement.

1,004,946. JUNCTION BOX. James Wares and James Wm. Kippen, Pullman Station, Ill. Filed Aug. 18, 1910. The distributing board in the box has longitudinal channels in its upper side receiving the main line wires, and a series of transverse busbars secured to the under side of the board and provided at their ends with binding posts.

1,004,956. ELECTRIC BED WARMER. John Alden, Boise, Idaho. Filed May 13, 1910. An incandescent lamp is contained in a metal casing which is covered with asbestos.

1,004,962. TROLLEY HARP. James T. Archer, Champaign, Ill. Filed July 11, 1910. The trolley head has a downwardly projecting stop arm which projects into and is adapted to swing in the segmental head of the casing when the trolley fork is

swung laterally in either direction, the stop arm being provided with a curved rod having a spring thereon.

1,004,995. TELEPHONE INSTRUMENT. Peete Basil Clarke, Liverpool, England. Filed Dec. 27, 1910. A flexible tube fits snugly around the mouth of the party talking.

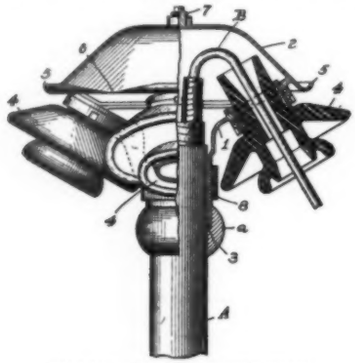
1,005,002. TERMINAL FOR ELECTRICAL CABLES. Charles W. Davis, Edgeworth, Pa., assignor to Standard Underground Cable Co., Pittsburgh, Pa. Filed May 8, 1909. Includes a case or shell formed in two parts meeting in a substantially horizontal plane and provided with an inlet orifice formed centrally in the lower part, and with a plurality of lead-out orifices radially arranged with respect to the inlet orifice, and interrupting the line of union of the parts.

1,005,003. TERMINAL STRUCTURE FOR ELECTRICAL CABLES. Charles W. Davis, Edgeworth, Pa., assignor to Standard Underground Cable Co. Pittsburgh, Pa. Filed July 1, 1909. Renewed Feb. 24, 1911. The shell is provided with a number of lead-out orifices, these being protected by a petticoat. Adjacent orifices are separated by a web.

1,005,004. MAIL-BOX ALARM. Gustav Henry Diemer, Trinidad, Colo. Filed Feb. 21, 1910. Renewed Mar. 2, 1911. The cover of a mail box is connected by means of a rod, to a knife switch, so that when the cover is raised to deposit mail, the circuit is closed and a bell is rung.

1,005,005. VACUUM CLEANER. Charles A. Dillon, Canton, O., assignor to United Electric Co., Canton, O. Filed Mar. 30, 1911. A vertical motor is direct conected to the shaft of the vacuum cleaner.

1,005,008. SELF-REGISTERING TARGET. Mark St. Clair Ellis, U. S. Navy, assignor to Self-Scoring Target Co. Filed June 1, 1910. Each of the customary target rings is represented by a plate spaced at equal intervals one before the other. Each plate is divided into quadrants which are separately mounted and are held in place by rods and spiral springs. On impact of bullet the spring pushing against a quadrant is compressed and a circuit closed, indicating on a registering device near the marksman the quadrant which was struck.



1,005,002.—CABLE TERMINAL.

1,005,023. ATTACHMENT PLUG. Gilbert W. Goodridge, Bridgeport, Conn., assignor to Bryant Electric Co., Bridgeport, Conn. Filed July 16, 1910. Has an insulating button, through which the wires are led to their respective terminals, in combination with a protective metallic cap crimped upon the exposed head of the button.

1,005,033. LIGHTNING ARRESTER. John D. Hilliard, Jr., and Charles E. Parsons, Glens Falls, N. Y. Filed Aug. 22, 1906. Comprises a line branch and an air gap, an automatic switch adapted to break the arc formed upon a discharge, and a high potential shunt around the switch normally inoperative, but becoming operative upon the occurrence of a high potential while the switch is in inoperative condition.

1,005,060. TWO-STEP KNIFE SWITCH. William Muirhead, Jr., New York, N. Y. Filed Apr. 26, 1911. The single-throw switch has a short contact and a long contact so arranged that on throwing the switch through a part of its swing it connects with the long contact. Pushing the switch as far as it goes will connect with the short contact disengaging the longer one. The short and long contact posts have fuses of different capacity connected in circuit.

1,005,084. ELECTRICAL CONTROLLER. John Godfrey Parry Thomas Chiswick, England. Filed Feb. 3, 1910. The periphery of a drum turning on a pivot is provided with cams which engage contacts rocking upon pivots. As each cam is turned in place it closes its particular contact.

1,005,107. AUTOMATIC VOLTAGE REGULATOR. Gabriele D'Eustachio and Paul von Lehoczky, Pittsburgh, Pa. Filed Nov. 14, 1905. Renewed Mar. 15, 1911. Combines a fixed and movable coil with cylinder and pistons, one of which is connected directly to the movable coil. A fluid between the two pistons actuates one piston when the other moves, changing the inductive relation of the coils. The movable potential coil is actuated by separate electromagnetic means.

1,005,111. ELECTRIC WATER-LEVEL INDICATOR. Edward E. Fieseler, Eastport, Md., assignor of one-half to Adam E. Martak, Eastport, Md. Filed Mar. 13, 1911. Contacts are placed at different levels on the inside of the tank. A float sliding on an iron rod makes contact with the various pairs of terminals as the water rises and falls. An annunciator indicates the position of the float, sounding an alarm at each change of level.

1,005,119. ATTACHMENT-PLUG FOR ELECTRIC WIRES. William C. Tregoning, Cleveland, O., assignor to Tregoning Electric Manufacturing Co., Cleveland, O. Filed Nov. 18, 1909. Comprises two interlocking separable members, a current-connecting screw shell sleeved upon and secured in place by and between the members and a central screw forming a terminal contact adapted to clamp the parts together.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired October 9, 1911:

527,050. DYNAMO-ELECTRIC HEATER. Herman B. Collins, Fulton, N. Y.

527,066. DEVICE FOR PROTECTING SEPARATELY EXCITED GENERATORS. Benjamin G. Lamme, Pittsburg, Pa.

527,070. ELECTRICAL CONVERTER. James W. Packard, Warren, O.

527,071. ELECTRICAL FUSE-BOX. James W. Packard, Warren, O.

527,075. RUNNING COMPOUND-WOUND DYNAMO-ELECTRIC MACHINES IN MULTIPLE. William B. Potter, Schenectady, N. Y.

527,092. CIRCUIT CONTROLLER FOR REGULATORS. Barton B. Ward, New York, N. Y.

527,099. ELECTRIC TRACK-SIGNAL. Charles R. Alsop, Middleton, Conn.

527,126. ELECTRIC LOCOMOTIVE. Nicolas J. Raffard, Paris, France.

527,177. ELECTRIC SWITCH. Raymond S. Kelsch, Chicago, Ill.

527,211. ELECTRIC-ARC LAMP. Max Mayer, New York, N. Y.

527,214. TELEPHONE TRANSMITTER. Thomas McCoubray, New York, N. Y.

527,225. ADJUSTER FOR FIELD MAGNETS OF DYNAMO-ELECTRIC MACHINES OR MOTORS. Montgomery Waddell, Bridgeport, Conn.

527,228 and 527,229. ELECTRIC-ARC LAMP. John E. Woolverton, New York, N. Y.

527,244. ELECTRIC LOCOMOTION ON RAILWAYS. Jean J. Heilmann, Paris, France.

527,257. ELECTRICAL SIGNAL. Harry H. Wister, Colorado City, Colo.

527,258. SIGNAL-RECORDING DEVICE. William H. Adkins, Rome, Ga.

527,265. CONDUIT SYSTEM FOR ELECTRIC RAILWAYS. William A. Butler, New York, N. Y.

527,267. SYSTEM OF ELECTRIC BLOCK-SIGNALS FOR RAILWAYS. William H. Cuthbert, Brooklyn, N. Y.

527,293. RAILWAY SWITCH. Augustin F. Schinner, Milwaukee, Wis.

527,294. TRACK SWITCH FOR ELECTRIC RAILWAYS. Augustin F. Schinner, Milwaukee, Wis.

527,298. ELECTRIC BATTERY. Milton E. Smith and Maurice F. Geer, Rochester, N. Y.

527,301. CONDUIT ELECTRIC RAILWAY. James R. Toole, Northumberland, Pa.

527,324. ELECTRIC HEATER. Jesse R. Davis, Parkersburg, W. Va.

527,379. APPARATUS FOR GENERATING ELECTRICITY BY SOLAR HEAT. Melvin L. Severy, Boston, Mass.

527,388. COIN-CONTROLLED ELECTRICAL APPARATUS. Henry F. Galligan, Lebanon, Mo.

527,392. CONDUIT FOR ELECTRIC RAILWAYS. David F. Graham, Springfield, O., and William P. Allen, Chicago, Ill.

527,414 and 527,415. ELECTRIC SIGNAL APPARATUS. Wilmer W. Salmon, Chicago, Ill.

527,468. CLOSED CONDUIT FOR ELECTRIC RAILWAYS. Charles D. Tisdale, Boston, Mass.

527,472. INSULATOR FOR ELECTRIC CONDUCTORS. George Webster, Philadelphia, Pa.

527,487. ELECTRICAL MEASURING INSTRUMENT. Hermann Herberts, Schenectady, N. Y.

527,502. ELECTRICAL SAFETY FUSE. Otto M. Rau, Milwaukee, Wis.

527,579. REGISTERING MECHANISM FOR ELECTRIC LIGHT CIRCUITS. William McNeill, Chicago, Ill., and James H. Tinder, Winchester, Ky.

527,580. TROLLEY FOR ELECTRICAL CONDUCTORS. David N. Oysor, Columbus, Ohio.

527,598. ELECTRIC CAB SIGNAL FOR RAILWAYS. Edgar C. Wiley, Bristol, Tenn.

527,644. TESTING INDICATOR FOR ELECTRIC RAILWAY CARS. Theodore Stebbins, Boston, Mass.